

Am. B. 3040

Proceedings

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Am. B. 3040

(99^m)

REPORT

OF

THE SECRETARY OF WAR,

COMMUNICATING,

In compliance with a resolution of the Senate of the 23d instant, a copy of a report from Lieutenant Colonel Graham of the harbors, &c., in Wisconsin, Illinois, Indiana, and Michigan, under his superintendence.

DECEMBER 30, 1856.—Read, and ordered to lie on the table.

JANUARY 2, 1857.—Ordered to be printed.

JANUARY 30, 1857.—Ordered to print rescinded, and report referred to the Committee on Printing.

FEBRUARY 18, 1857.—Report in favor of printing the usual number; report considered and agreed to.

WAR DEPARTMENT,
Washington, December 27, 1856.

SIR: In compliance with the resolution of the Senate of the 23d instant, "that the Secretary of War be directed to communicate to the Senate a copy of the survey and report of Lieutenant Colonel Graham, of the harbors, &c., in Wisconsin, Illinois, Indiana, and Michigan," I have the honor to transmit, herewith, a communication of the Colonel of Topographical Engineers, enclosing the report of Lieutenant Colonel Graham, on the harbors under his superintendency, except those referred to in Senate Executive Document No. 77, 1st session, 34th Congress.

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

Hon. J. D. BRIGHT,
President pro tem. of the Senate.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, December 26, 1856.

SIR: The resolution of the Senate of the 23d December, 1856, calls for a copy of the report and survey of Lieutenant Colonel Graham, of the harbors, &c., in Wisconsin, Illinois, Indiana, and Michigan, being the extent of Lieutenant Colonel Graham's superintendence.

In reply, I have the honor to submit a copy of a report from Lieutenant Colonel Graham, of the different harbors under his superintendence, except those referred to in Senate Ex. Doc. No. 77, 1st session, 34th Congress.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

WAR DEPARTMENT,
Washington, May 22, 1856.

SIR: In compliance with the resolution of the Senate of the 29th ultimo, I have the honor to transmit herewith copies of "the reports lately made by Lieutenant Colonel J. D. Graham, of the Corps of Topographical Engineers, relating to the harbors and commerce of the lakes and rivers within the States of Wisconsin and Michigan."

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

Hon. J. D. BRIGHT,
President pro tem. of the Senate.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 22, 1856.

SIR: In obedience to a resolution of the Senate of the 29th April, I have the honor to submit "the reports lately made by Lieutenant Colonel J. D. Graham, of the Corps of Topographical Engineers, relating to the harbors and commerce of the lakes and rivers within the States of Wisconsin and Michigan."

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

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I certify the within to be a true copy.

J. D. GRAHAM,
Lieutenant Colonel, &c., &c.

* NOTE.—Part 2 of the report for the year 1855 is omitted in the printing, because all the information it contained is re-embodied in the latter part of the report for 1856, which constitutes part 2 of this volume.

† NOTE 2.—Part 3, embracing the maps and illustrative drawings, was excluded by the order of the Senate for the printing of those reports.

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1. The purpose of this report is to provide a comprehensive overview of the current state of the project and to identify the key areas for improvement. The report is organized into several sections, each of which addresses a specific aspect of the project. The first section discusses the overall goals and objectives of the project, while the second section provides a detailed analysis of the current progress. The third section identifies the major challenges and risks that the project is currently facing, and the fourth section outlines the recommended actions to address these issues. The final section provides a summary of the findings and conclusions of the report.

2. The first section of the report discusses the overall goals and objectives of the project. The primary goal of the project is to develop a new product that meets the needs of the market and provides a competitive advantage for the company. The secondary goals are to ensure that the product is developed in a timely and cost-effective manner, and to ensure that the product is of high quality and meets the needs of the customer.

3. The second section of the report provides a detailed analysis of the current progress of the project. The project has made significant progress in the development of the product, and the major components of the product have been developed and tested. However, there are still several areas that need to be addressed, including the integration of the different components and the testing of the final product.

4. The third section of the report identifies the major challenges and risks that the project is currently facing. The major challenges include the limited resources available for the project, the complexity of the product, and the need to meet the market requirements. The major risks include the possibility of delays in the development of the product, the possibility of cost overruns, and the possibility of the product not meeting the market requirements.

5. The fourth section of the report outlines the recommended actions to address the challenges and risks identified in the third section. The recommended actions include increasing the resources available for the project, simplifying the product design, and improving the project management process. The recommended actions also include conducting regular communication with the customer and the market, and ensuring that the product is developed in a timely and cost-effective manner.

6. The final section of the report provides a summary of the findings and conclusions of the report. The findings of the report indicate that the project is currently facing several challenges and risks, but that these can be addressed by implementing the recommended actions. The conclusions of the report are that the project is on track to meet its goals and objectives, and that the product will be developed in a timely and cost-effective manner.

7. The purpose of this report is to provide a comprehensive overview of the current state of the project and to identify the key areas for improvement. The report is organized into several sections, each of which addresses a specific aspect of the project. The first section discusses the overall goals and objectives of the project, while the second section provides a detailed analysis of the current progress. The third section identifies the major challenges and risks that the project is currently facing, and the fourth section outlines the recommended actions to address these issues. The final section provides a summary of the findings and conclusions of the report.

8. The first section of the report discusses the overall goals and objectives of the project. The primary goal of the project is to develop a new product that meets the needs of the market and provides a competitive advantage for the company. The secondary goals are to ensure that the product is developed in a timely and cost-effective manner, and to ensure that the product is of high quality and meets the needs of the customer.

9. The second section of the report provides a detailed analysis of the current progress of the project. The project has made significant progress in the development of the product, and the major components of the product have been developed and tested. However, there are still several areas that need to be addressed, including the integration of the different components and the testing of the final product.

10. The third section of the report identifies the major challenges and risks that the project is currently facing. The major challenges include the limited resources available for the project, the complexity of the product, and the need to meet the market requirements. The major risks include the possibility of delays in the development of the product, the possibility of cost overruns, and the possibility of the product not meeting the market requirements.

11. The fourth section of the report outlines the recommended actions to address the challenges and risks identified in the third section. The recommended actions include increasing the resources available for the project, simplifying the product design, and improving the project management process. The recommended actions also include conducting regular communication with the customer and the market, and ensuring that the product is developed in a timely and cost-effective manner.

12. The final section of the report provides a summary of the findings and conclusions of the report. The findings of the report indicate that the project is currently facing several challenges and risks, but that these can be addressed by implementing the recommended actions. The conclusions of the report are that the project is on track to meet its goals and objectives, and that the product will be developed in a timely and cost-effective manner.

PART I.



Lieutenant Colonel J. D. Graham's annual report (No. 116) on the harbor improvements of Lakes Michigan and St. Clair for 1855: embracing the portion of the report for 1855 which relates to the Lake Michigan harbors that are within the States of Illinois and Wisconsin.

[No. 116.]

OFFICE GENERAL SUPERINTENDENCE OF LAKE
MICHIGAN AND LAKE ST CLAIR HARBOR WORKS,
Chicago, December 31, 1855.

SIR: I have the honor to submit this my report of the operations and progress of the works under my direction since I was assigned to my present station, in April, 1854.—(See A 1 to A 4, inclusive.)

The bureau was duly apprized of the causes, beyond all human control, which prevented the rendering of my annual report last year. These causes were, an accident from the overturning of my travelling carriage, in the darkness of the night, while in the active performance of my duty, on the 11th of October, 1854, by which I suffered a severe contusion that confined me to my bed and room for several weeks; and afterwards, when I had recovered from the effects of this accident, I was attacked by a painful illness, brought on by severe exposures in the performance of my public duties, which illness continued throughout the winter, as was shown by the certificates of my attending physician, duly rendered to the bureau. This much I owe it to myself to state, because the naked fact was published that I had rendered no report, without any mention of the causes which prevented it.

On taking my station here, in April, 1854, I made it my first duty to inspect the various works assigned to my direction, and especially the mode that had previously been pursued in constructing the piers for the formation or protection of the several harbors on Lake Michigan. These piers are formed of a succession of hollow cribs built of timber, and filled with stone to keep them in position and to give them the necessary weight to resist the action of the lake waves. The cribs used in forming the piers for the several harbors are found to vary from fifteen to thirty feet in width, and from thirty to forty, and, in some cases, even fifty feet in length. They are strengthened by cross-ties placed at an average distance of ten to fifteen feet apart, uniting together the successive layers of longitudinal timbers which form the two outward and parallel faces, or walls, of the crib. In no case which came under my observation, when I took my station here, were these cross-ties found to be placed in the same vertical plane, one

above another, so as to form a series of solid vertical transverse walls of timber, similar to those formed by the disposition of the timbers for the outward longitudinal faces of the cribs. On the contrary, these cross-ties have, in every case that I have witnessed, been heretofore disposed for each series in two alternate or open tiers—the one generally twenty inches in advance of the other, measured between the centre of the timbers, as shown at a a, &c., and b b, &c., in figures 1 and 2 of the accompanying perspective drawing, marked “sheet G No. 18.” Moreover, these ties have generally consisted of round timber, only eight or ten inches in diameter, often with the bark left on. It is a common thing to find them fractured, near the middle, by the weight of stone resting in the spaces between the consecutive timbers of the same tier. In some cases the cribs are found to have been built twenty-five and even thirty feet wide without any intermediate support for the cross-ties between their extremities. The duration of these, without fracture near the middle, has been short. The mode of disposing of the iron bolts has often been to drive them at the joints through the dovetailed ends of the cross-ties, thus fastening these dovetails to the longitudinal timbers above and below. This we consider very objectionable, because the dovetails are thus liable to be split and weakened; and it is a matter of chief importance that they should be preserved as perfect as possible, because upon them depends the power necessary to resist the force of the stone within the cribs, in its tendency to separate the outward longitudinal faces from the cross-ties, a catastrophe which would destroy entirely the utility of the crib.

It has also been a general practice, heretofore, to drive piles within the cribs near the ends of the cross-ties, (see c, figures 1 and 2 of sheet G No. 18.) Gains, two inches deep, are cut into the interior faces of the cross-ties, near their ends, to admit these piles, which are one foot square in size (see d, same sheet.) These piles serve for vessels to make fast to when lying alongside of the piers. The principal object in introducing them, however, was, that it was thought they would be beneficial in resisting the tilting of the cribs to one side in case of their being undermined by the washing away of the soil at their bottoms, from the action either of a littoral current, or of the waves of the sea. Experience has, however, fully shown that these piles have not strength enough to resist the great weight of the stone within the cribs and thus prevent their tilting, should there exist cause to produce it, and that all the force of resistance they possess is, in such a case, exerted to wrench asunder the longitudinal timbers from the cross-ties, and thus injure or destroy the efficacy of the crib. For this reason I have caused them to be excluded from the interior of the cribs on all the works under my direction. For the accommodation of vessels in making fast to the piers, and as guides in alligning the cribs while the construction of the piers is going on, they are required to be driven on the *outsides* of the cribs, as will be hereafter shown.

Another peculiarity, which we consider very objectionable, in the former mode of constructing these piers, consists in locking the cribs together at their ends, by cutting away one-half of the thickness of the longitudinal side-timbers, for about a foot of their length at each

end, so as to form a close joint when the locking takes place, as at e, e, &c., in figures 1 and 2 of sheet G No. 18. In case of a tendency of one crib to tilt to one side more than its neighbor, which often happens, the great weight of the stone within the crib which tilts the most, would cause a rupture and slivering at the locked joints, by which effect the dovetails at the ends of the cross-ties would be loosed from their beds in the longitudinal timbers, and the union of the parts be broken. I have therefore excluded this feature from all the pier work at the harbors under my direction, and have required that the cribs be placed simply and close together, end to end, as will be more fully shown hereafter, so that if there be any tilting of a crib from the washing away of the soil underneath it, it shall not be the cause of any disturbance of its neighbor, in position, or of weakening the union of the longitudinal with the cross timbers.

For similar reasons, the scarfing of the timbers above the water level, for the purpose of breaking the joints where the cribs unite, in forming a line of pier-work, in the manner shown in figure 8 or figure 9 of the accompanying drawing, marked "sheet G No. 19," has been omitted.

I have observed, in many instances, upon the harbor piers of Lake Michigan, that the strength or power afforded by this scarfing of the timbers above the water level is by no means sufficient to prevent irregularity in the degree of tilting of the several cribs, according to the varying quantity or depth of soil that may be removed from one side, at their bottoms, by the varying velocity of the littoral current, combined, often, with a difference in the tenacity of the soil on which the several cribs may rest. Hence, a violent torsion is produced in the overlapping portions of these upper timbers, frequently powerful enough to wrench them apart in spite of the iron bolts by which they were, in the first place, fastened together. The several cribs will then settle down to their new bearings in the same manner, and with all the irregularity which would have attended them had there been no scarfing above the water level. The great weight of stone within the several cribs, acting to produce the effect above described, makes the problem self-evident. Then, the work of adjusting them, by building up above the water level, becomes much more difficult and expensive than if the cribs were brought simply together all the way from bottom to top, and each left to tilt its own way (unless it can be prevented by other means) without acting upon its neighbor. Any small and unavoidable opening between the cribs at their junction, one with another, is remedied at the top, or road-way, by adjustments of the flooring and its sleepers.

The only mode of preventing, or greatly reducing the tendency of the cribs to tilt, when the soil underneath them is removed by the current, or sea-wave, seems to be that prescribed by the bureau and the board of engineers, of constructing them with open bottoms, or with bottoms having a grillage or lattice-work form, with openings large enough to admit the free passage of the stones, so that they may be constantly dropping through, and thus supply the place of the removed soil as fast as it can be washed away.

The lattice form of bottom has been adopted for all the cribs con-

structed for the harbor works under my direction. They give more strength to the cribs than if left with bottoms entirely open.

I will now proceed to describe, in detail, the plans which have been adopted for the construction of the cribs to form the piers and breakwaters for the improvement of the harbors under my direction, and beg leave to refer, in illustration, to the drawings shown in the accompanying sheets, marked G Nos. 19, 20, and 21. The first mentioned of these sheets shows all the details of construction, and the allignment in position, of two cribs, each 32 feet long, 20 feet wide, and 17 feet high, or, sunk in water 12 feet deep, and rising to a height of five feet above the water level.

Figure 1 shows the mode of laying the grillage or latticed bottom.

In the first place, two tiers of timbers are laid to form the commencement of the two outside longitudinal walls (see f and g of fig. 4,) and the three transverse walls, (see h and i of fig. 2,) and the first tier (k in figs. 6 and 10,) of the middle longitudinal wall, or tier of stringers. Then the lower or transverse timbers *c d* (fig. 1) for the bottom, are laid in the same horizontal plane with the second timber of the transverse walls, or tiers of cross-ties, and, like them, with their ends half dovetailed, and one-fourth of their thickness cut away at those ends, are let 3 inches deep into gains of the same shape cut into the second tier of timbers of the outside longitudinal walls; and they are laid flat upon the first timber of the *middle* longitudinal wall, at the crossings therewith. Then the upper or longitudinal lattice timbers *a b* are laid, as shown in the drawing, flat upon and transversely of the timbers *c d*, without being let into them, because this would involve the expense of cutting 48 gains 6 inches deep to bring them all into the same plane. To avoid this expense, they are laid, simply, one tier upon the other, and bolted at every crossing by wrought-iron bolts twenty inches long and 1 inch by 1 inch square, or by round bolts $1\frac{1}{2}$ inch in diameter, according to circumstances hereafter to be mentioned. The crib is then built up by successive tiers of timbers, locked together, and forming six solid walls (three longitudinal and three transverse) in a manner that will be best understood by an inspection of figures 2, 3, 4, 5, and 6, of sheet G No. 19.

In this way four separate compartments are formed, bounded by solid walls of timber, each $12\frac{1}{2}$ feet long and $8\frac{1}{2}$ feet wide, for the reception of the stone ballast. It will be seen in fig. 1, that, besides the timbers appertaining to these six solid walls, there are four longitudinal and six transverse grillage, or lattice-work timbers arranged symmetrically as to distance, which leave forty-eight open spaces, each two feet four and a half inches, by two feet two inches in the clear, for the stone to drop freely through should it become necessary—from the washing away of the soil at bottom—to have its place filled with stone in order to prevent the tilting of the cribs. These spaces are large enough for the free passage of the largest boulder stones to be procured in the vicinity of many of the harbors to be improved. In cases where the stones are so large as to require spaces still greater for their free passage, the latticed bottoms would be formed as shown in fig. 1, of sheet G No. 22, or sheet G No. 23.

The vertical sections given in figures 3, 5, 6, and 10, of sheet G

No 21, show the mode of bolting each pair of adjacent timbers together by iron bolts, 20 inches long, without in any case driving them through the dovetailed joints. For the reason already stated, such a mode of bolting was considered to be inadmissible. Each line of bolting must consist of two rows of bolts, as shown in the drawings. In order to bind with a sufficient firmness the longitudinal timbers at the joints of the cross-ties, and to render those joints secure, it will be seen that there are two vertical rows of bolts on each side of every tier of joints, placed at such a distance as to prevent any slight splitting of the timbers that might occur in driving, from extending to those joints. This distance is one foot, and the rows are one foot apart, except at the ends of the cribs where a uniform distance of eight inches is preserved as a security against weakness from splitting, as shown in figures 3, 5, 6 and 10.* It is for this reason that the two outside transverse walls are placed two feet within the extremities of the timbers which form the two outside longitudinal walls. This space of two feet allows 8 inches space between the extremities of these last mentioned timbers and the first row of bolts, the same between that row and the second row of bolts, and the same between it and the dovetailed joints where the longitudinal and transverse timbers are locked together. It will be seen that this first space is only 7 inches at the extremities of the timbers forming the *middle* longitudinal wall. It was here reduced 1 inch in length at each extremity, in order that when the cribs came to be alligned in position a perfect contact should be insured at the extremities of the *outside* longitudinal walls, and not be interrupted by any slight error in the dressing of the extremities of the timbers of the *middle* longitudinal walls.

This effect is shown (in sheet G No. 19) on the line *l l* of figure 4, and at *V V* in figure 7; whereas at *Z Z* of figure 7, and also in figure 10, it will be seen that there is a space of two inches between the adjacent extremities of the middle longitudinal walls of two contiguous cribs.

This arrangement, as will be seen by figure 7, leaves two hollow compartments, each $8\frac{1}{2}$ feet by 4 feet in the clear, at every junction of two cribs. It is not proposed to fill these spaces with stone, because the pressure would tend to rupture the extremities of the timbers of the outside longitudinal walls, which should be preserved as perfect as possible on account of the important bolting they contain. In case of any imperfection or opening at the junction of two contiguous cribs arising from an irregular bottom, the interruption of rocks, &c., then, in order to prevent the waves of the sea from breaking through these joints, those spaces should be filled with clay, and, if necessary, piles should be driven on the outsides at the joints to aid in closing them; otherwise, there might be an accumulation of sand from the constant action of the waves that would in time diminish the depth of water within the piers.

The piles *e e*, &c., shown in figures 4 and 7, driven on the outsides

* It will be seen by figures 6 and 10, that the distance between the ends of the timbers which form the *middle* longitudinal wall and the outside row of bolts, is reduced to 7 inches. The reason for this will be explained hereafter.

of the cribs may serve as guides in alligning them ; and they are useful for vessels to make fast to.

The dimensions of all the timbers of which the cribs are composed, and of the sleepers and plank for the flooring, and the mode of arranging and fastening them, are sufficiently described in the remarks on the drawings, and scarcely need be repeated here.

Sheet G No. 20 presents a second case for the construction of a crib of the same dimensions as that above described, where the stones to be used for ballast are too large to admit of their passing through the apertures in the grillage for case 1st, shown on sheet G No. 19.

Here, on sheet No. 20, independent of the timbers belonging to the three longitudinal and the three transverse walls, there are but *two* longitudinal and but *four* transverse timbers appertaining to the latticed bottom. This leaves 18 (eighteen) open spaces in the bottom, each three feet nine inches long by three feet six inches wide, which will admit the free passage through them of stones not larger than three feet four inches in their greatest dimensions. Although we have but seldom found boulder stones convenient to the works so large as this, yet it has sometimes occurred ; and inasmuch as the larger the dimensions of the stones the more difficult it is for the sea waves to force them from their positions after they shall have dropped through the bottoms of the cribs, it is very necessary, whenever they can be obtained so large, to construct the latticed bottoms of the cribs so that these stones may pass freely through their open spaces.

It will be seen that the length of the iron bolts in sheet G No. 20 is thirty inches, while in sheet G No. 19 they are only twenty inches long. Those of the shorter length are more easily driven than those that are longer, and they will prove sufficient in cases where the cribs are not exposed to the most violent action of the sea waves ; as, for instance, in these sections of pier work lying in shoal water or near to the shore. But for those works which have to resist the full force of the sea waves, the bolts should not be less than thirty inches long, so as to penetrate through two and half way into a third timber whose dimensions are one foot square. We have sometimes caused these bolts to be pointed at one end, but experience shows that there is no advantage from this. The better way is, I conceive, to cut them square off at both ends, taking care that the holes for them to enter are bored about two inches deeper than the length of the bolts, in order to provide a receptacle for any small rubbish that might be left within them. The bolts are not headed before driving, as the force of driving will head them sufficiently if they be of good tough wrought iron, which it is essential they always should be.

In cases where iron bolts of one inch square are used, the holes are bored with an auger that makes them one inch, precisely, in diameter. The diagonal edges of the bolts will then cut into the timber, and insure a powerful adhesion, to resist their drawing. To increase this resistance, these square bolts are sometimes ragged at the corners, in a direction to resist their being drawn.

The bolts are sometimes made of round iron of one and a half inch in diameter, especially where a great force of the sea is to be resisted. The holes to receive these are bored with an auger that gives them a

diameter of one inch and three-eighths, or an eighth of an inch less than the diameter of the bolts. The bolts are then forced home into their places by two strikers, each using sledge-hammers of iron, from twenty to twenty-five pounds in weight. For the shorter bolts, sledges of twelve to fifteen pounds weight will answer.

Sheet G No. 21 shows a plan for, and all the details of, constructing and joining in position two cribs, each thirty feet long and twenty-five feet wide, suitable, under the rule laid down by the board of engineers and approved by the bureau, to a depth of twenty feet of water. The total height of the cribs, from bottom to top, would then be twenty-five feet, and the rule requires that the width of the cribs should not be less than their total height. The plan and details upon this sheet were composed in this office, with especial reference to the construction of the breakwaters for Waukegan, in Illinois, and Michigan city, in Indiana. The longitudinal timbers for those works, procured before I was placed in charge of the harbor improvements on Lake Michigan, were found to be thirty feet long, and the plan had necessarily to be made to suit this circumstance. By reference to this sheet it will be seen that, independent of the timbers belonging to the three longitudinal and the three transverse walls, there are, for the latticed bottom, (see figure 1,) four longitudinal and four transverse timbers. This gives us, in the latticed bottom, thirty six open spaces, each three feet and two inches long, by three feet wide, which will admit the free passage through them of stones whose greatest dimension does not quite reach to three feet. The bolts are here also cut to a length of thirty inches. The general details in regard to this sheet will be sufficiently understood by a reference to the plan, elevations, and sections drawn upon it.

I herewith also transmit a wooden model, on a scale of half an inch to one foot, (or $\frac{1}{24}$, lineal, of real size,) of a crib 32 feet long, 20 feet wide, and 12 feet high, showing the formation of the latticed bottom above described, and the mode of preparing and framing together all the timbers for the body of the crib. The bolting of the timbers and the flooring at top are omitted in the model, because they would prevent the convenient inspection of the details in regard to the main features of the plan.

By reference to the drawings, however, they cannot fail to be understood at a glance.

Materials required for the construction of these cribs.

The following tables, marked T 1, T 2, and T 3, will serve as convenient references in computing the quantity of materials for constructing a crib of any required height, under either of the three cases described. They are computed, in each case, for a crib suitable for a depth of five feet of water, and rising five feet more above the water surface, or having a total height of ten feet from the soil at bottom to the top or flooring of the crib. The items marked d, h, and k, show the quantity and description of the additional materials required for each foot of height beyond five that the crib may be required to be raised between the bottom and the water surface.

The quantity and description of materials required in each case *above the water surface* will not vary from the tables, (see items b, a, f, e, and $\frac{4}{5}$ i,) so long as the rule now established prevails, of limiting the height of the cribs to five feet above the water surface.

TABLE T 1.

CASE 1. *For a crib 32 feet long, 20 feet wide, and ten feet high, from bottom to top; that is, five feet of its height being under water, and five feet above the water surface.*—(See drawings, sheet G No. 19.)

TIMBER.—*Timber required below the water surface.*

Cubic feet of pine.

1. For the latticed bottom—	
Six cross pieces of pine timber, each 20 feet long and 1 foot square	120
Four longitudinal pieces of pine timber, each 30 feet long and 1 foot square, resting on the cross pieces	120
Total for latticed bottom	240
2. For the two longitudinal outside walls—	
Ten pieces of pine timber, each 32 feet long and 1 foot square	320
3. For the middle longitudinal wall—	
Two pieces of pine timber, each $12\frac{1}{2}$ feet long and 12 inches by 6 inches	$12\frac{1}{2}$
Three pieces of pine timber, each 32 feet long and 1 foot square	96
Total for the middle longitudinal wall	$108\frac{1}{2}$
4. For the three transverse walls—	
Fifteen pieces of pine timber, each 20 feet long and 1 foot square	300
Total of pine timber required for five feet height, above bottom	$968\frac{1}{2} = c.$
5. For each additional foot in height, of the crib below the water surface—	
Three longitudinal pieces of pine timber, each 32 feet long and 1 foot square	96
Three cross timbers of pine, each 20 feet long and 1 foot square	60
Total for each additional foot under water	$156 = d.$

Cubic feet of oak.

6. Timber required above the water surface—

Ten pieces of white oak timber for the two outside longitudinal walls, each 32 feet long and 1 foot square	320
Four pieces of white oak timber, each 32 feet long and 1 foot square, for the middle longitudinal wall	128
One piece of white oak timber, 32 feet long and 1 foot by 9 inches, being the top timber of the middle longitudinal wall, upon which the flooring will rest...	24
Twelve cross timbers of white oak, for the three transverse walls, each 20 feet long and 1 foot square.....	240
Four oak piles, each 30 feet long and 1 foot square...	120
Four sills of white oak to support the flooring, each 32 feet long and 9 inches by 6 inches. (These are laid into notches cut 6 inches wide and 6 inches deep, into the top timbers of the three transverse walls).....	48

Total of white oak timber required for 5 feet height above the water surface 880=b.

Feet, board measure, oak plank.

7. For the flooring—

Thirty-nine pieces of white oak plank, each 19 feet long, 3 inches thick, and 8 inches wide, (laid 2 inches apart,) as shown in fig. 7 of sheet G No. 19	1,482=a.
--	----------

IRON BOLTS AND SPIKES.—*Bolts under water.*

Pounds.

8. For the latticed bottom, (fig. 1 sheet G No. 19)—

Forty-five bolts, each 20 inches long, of wrought-iron, one inch square, = 75 lineal feet, weighing 3.38 lbs. per lineal foot.....	253.5
--	-------

9. For the two outside longitudinal walls, for 5 feet high above the soil at bottom—

Fifty-three bolts, each 20 inches long, = 88.3 lineal feet, as above.....	298.5
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10. For the middle longitudinal wall for 5 feet in height above the soil at bottom—

Twelve and two-fifths bolts, each 20 inches long, = 20.66 lineal feet, as above.....	69.8
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11. For the three transverse walls, for 5 feet above the soil at bottom—

Fifty-two and four-fifths bolts, each 20 inches long, = 88 lineal feet, as above.....	297.5
---	-------

Total of wrought-iron, 1 inch square, for bolts for the first 5 feet of height above the soil at the bottom... 919.3=g.

12. For each additional foot in height, under water, the equivalent of 30 bolts, each 20 inches long, = 50 lineal feet, as above..... 169 = h.
-

Bolts above the water surface for a height of five feet above that surface.

Pounds.

13. For the three longitudinal walls—
82 $\frac{4}{5}$ bolts, each 20 inches long, = 138 lineal feet, as above..... 466.5
14. For the three transverse walls—
43 $\frac{1}{5}$ bolts, each 20 inches long, = 72 lineal feet, as above..... 243.3
-
- Total of wrought-iron, 1 inch square, for bolts for a height of 5 feet above the water surface..... 709.8 = f.
-

Spikes of wrought-iron.

15. For fastening the four sleepers to the top timbers of the three transverse walls—

Pounds.

- 12 spikes, each 15 inches long, of wrought-iron $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, = 15 lineal feet, weighing 0.475 of a pound per lineal foot..... 7.1
- 546 spikes, for fastening the plank flooring to the sleepers, each 6 inches long and $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, = 273 lineal feet, as above..... 129.7
-

Total of wrought-iron spikes $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square 136.8 = e.

HARD BOULDER STONE.

It has been before stated that each crib, under this case, has 4 hollow compartments, each having a clear interior space of 12 $\frac{1}{2}$ feet by 8 $\frac{1}{2}$ feet, giving the area of a horizontal section of each compartment, = 106.25 square feet, or, for the 4 compartments of each crib, 425 square feet. This, multiplied by 5 feet, gives for the cubic contents of the 4 compartments of a crib, 5 feet high from the soil at bottom to the water surface, 2,125 cubic feet.

16. Or 78.7 cubic yards, = i, which is the quantity of stone required to fill each crib to the water surface.

By an inspection of fig. 3, it will be seen that an additional height of 4 feet will bring the stone to the lower surface of the sleepers which support the flooring. The stone should rise no higher than this, because their pressure would have a tendency to derange the sleepers from their positions, and consequently the flooring also.

17. Then $425 \text{ square feet} \times 4 = 1,700 \text{ cubic feet} = 62.96 \text{ cubic yards} = \frac{4^i}{5}$, which is the additional quantity of stone necessary for filling the crib from the water surface to the sleepers.

18. Each additional foot in height, over and above *five*, which the crib may be required to have, will require an additional quantity of stone $= 425 \text{ cubic feet}$, or $= 15.74 \text{ cubic yards}$, $= k$.

Let $t =$ the quantity of timber,

$v =$ the quantity of iron in pounds,

$w =$ the quantity of stone in cubic yards, required to construct a crib, under case 1st, to be placed in water deeper than five feet.

Let $n =$ the depth in feet, over and above *five*, of the water in which the crib is to be placed.

Let $g + f = r$, being similar materials.

Then $t = a + b + c + (d \times n)$,

$v = e + r + (h \times n)$,

$w = i + (k \times n)$, provided the crib is to be filled with stone to the water surface only.

But if the crib is to be filled up to the lower surface of the sleepers, then will $w = \frac{9^i}{5} + (k \times n)$.

If it should be required to compute the quantity of materials necessary for the construction of a pier work of any length,

Let $x =$ the quantity of timber,

$y =$ the quantity of iron,

$z =$ the quantity of stone, in cubic yards, required for the said pier work.

Then let $n =$ the *average* depth of water in feet, over and above *five*, that the pier is to occupy.

Let $m =$ the number of cribs necessary for the said pier work.

Then $x = \frac{a + b + c + (d \times n)}{1} \times m$,

$y = \frac{e + r + (h \times n)}{1} \times m$,

And $z = \frac{i + (k \times n)}{1} \times m$; provided the cribs composing the pier work are to be filled with stone to the water surface only.

But if these cribs are all to be filled with stone up to the lower surface of the sleepers, the flooring then will—

$z = \frac{9^i}{5} + (k \times n) \times m$.

TABLE T 2.

CASE 2. *For a crib 32 feet long, 20 feet wide, and 10 feet high from bottom to top; that is, five feet of its height being under and five feet above the water surface.*—(See drawings, sheet G No. 20.)

TIMBER.—*Timber required below the water surface.*

Cubic feet of pine.

1. For the latticed bottom—

Four cross pieces of pine timber, each 20 feet long and 1 foot square..... 80

Two longitudinal pieces of pine timber, each 30 feet long and 1 foot square, resting on the cross pieces. 60

For the three longitudinal and the three transverse walls—the same as case 1, (see item 2, 3, and 4, of that case,)..... $728\frac{1}{2}$

Total of pine timber required for a height of 5 feet above the soil at bottom..... $868\frac{1}{2} = c.$

2. For each additional foot in height of the crib below the water surface—the same as in case 1, (see item 5 of that case,)..... $156 = d.$

Timber required above the water surface.

Cubic feet of white oak.

3. For the three longitudinal and the three transverse walls, and four oak piles, and the four sills to support the flooring—the same as in case 1, (see item 6 of that case,)..... $880 = b.$

Feet, board measure, of 3-inch oak plank.

4. For the flooring—
The same as in case 1—(see item 7 of that case,)... $1,482 = a.$

IRON BOLTS AND SPIKES.—*Bolts under water.*

Pounds.

5. For the latticed bottom—

Twenty-one bolts, each 20 inches long, of wrought-iron one inch square = 35 lineal feet, weighing 3.38 pounds per lineal foot..... 118.3

6. For the two outside longitudinal walls—

Thirty bolts, each 30 inches long = 75 lineal feet, as above..... 252.5

Six bolts, each 20 inches long = 10 lineal feet, as above..... 33.8

7. For the middle longitudinal wall—	Pounds.
The equivalent of $6\frac{4}{5}$ bolt, each 30 inches long = 17 lineal feet.....	57.5
Three bolts, each 18 inches long = $4\frac{1}{2}$ feet	15.2
8. For the three transverse walls—	
The equivalent of $33\frac{3}{5}$ bolts = 30 inches long= 84 feet.....	283.9
Total of wrought iron, 1 inch square, for bolts for the first 6 feet of height above the soil at bottom	762.2=g.
9. For each additional foot in height, under water—	
The equivalent of 20 bolts, each 30 inches long= 50 lineal feet.....	169 = h.

Bolts above the water surface.

10. For the two outside longitudinal walls—	
The equivalent of $32\frac{2}{5}$ bolts, each 30 inches long, = $81\frac{1}{2}$ feet.....	275.4
6 bolts, each 20 inches long = 10 feet	33.8
11. For the middle longitudinal wall—	
The equivalent of $17\frac{1}{5}$ bolts, each 30 inches long, = 43 feet.....	275.4
3 bolts, each 20 inches long, = 5 feet.....	26.9
12. For the three transverse walls—	
The equivalent of $28\frac{4}{5}$ bolts, each 30 inches long, = 72 feet.....	243.3
Total of wrought iron, 1 inch square, for bolts, for a height of five feet above the water surface.....	714.7 = f.

Spikes of wrought iron.

13. For fastening the four sleepers to the top timbers of the three transverse walls, and for fastening the plank flooring to the sleepers, the same as in case 1, (see item 15 of that case,) viz: 12 spikes, each 15 inches long, and 546 spikes, each 6 inches long, of wrought iron, $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, = 288 lineal feet, weighing 0.475 of a pound per foot $136.8 = e$ pounds.

HARD BOULDER STONE.

14. For filling the four compartments of the crib to the water surface, the same as in case 1, (see item 16 of that case,) 78.7 cubic yards = i.

15. For filling the same between the water surface and the lower surface of the sleepers, the same additional quantity as in case 1, (see item 17 of that case,) 62.96 cubic yards = $\frac{4}{5}$ i.

16. For each additional foot in height that may be required for the crib, the same as in case 1, (see item 18 of that case,) 15.74 cubic yards = k.

The formulæ of computation for the quantity of materials required to construct a crib of greater height and to construct a pier of any length are the same for this case as those given above for case 1. The values of the terms in the equations will only require to be varied according as they are given in table T 2.

TABLE T 3.

CASE 3. *For a crib 30 feet long, 25 feet wide, and 10 feet high from bottom to top; that is, five feet from the soil at bottom to the water surface, and five feet above the water surface.*—(See the drawings in sheet G No. 21.)

TIMBER.—*Timber required below the water surface.*

	Cubic feet of pine.
1. For the latticed bottom—	
Four cross timbers of pine, each 25 feet long, and 1 foot square.....	100.
Four longitudinal cross timbers of pine, 28 feet long, and 1 foot square.....	112.
2. For the two outside longitudinal walls—	
Ten pieces of pine timber each 30 feet long, and 1 foot square	300.
3. For the middle longitudinal wall—	
Three pieces of pine timber each 30 feet long, and 1 foot square.....	90.
Two pieces of pine timber each $11\frac{1}{2}$ feet long, and 12 by 6 inches.....	11.5
4. For the three transverse walls—	
Fifteen pieces of pine timber each 25 feet long, and 1 foot square.....	375.
Total of pine timber required for five feet in height above the bottom.....	988.5 = c.
5. For each additional foot in height below the water surface—	
Three longitudinal pine timbers, each 30 feet long, and 1 foot square.....	90.
Three cross timbers of pine, each 25 feet long, and 1 foot square.....	75.
Total for each additional foot of height, under water.....	165. = d.

Cubic feet of white oak.

6. Timber required above the water surface—

Ten pieces of white oak timber, for the two outside longitudinal walls, each 30 feet long, and 1 foot square.....	300.
Four pieces of white oak timber, for the middle longitudinal wall, each 30 feet long, and 1 foot square.....	120.
One piece of white oak timber 30 feet long, and 1 foot by 9 inches, being the top timber of the middle longitudinal wall, upon which the flooring will rest.....	22.5
Twelve cross timbers of white oak, for the three transverse walls, each 25 feet long, and 1 foot square.....	300.
Four white oak piles each 35 feet long, and 1 foot square.....	140.
Four sills of white oak, to support the flooring, each 30 feet long, and 9 inches by 6 inches.....	45.
Total white oak timber required for 5 feet in height, above the water surface.....	927.5 = b.

7. For the flooring, thirty-six pieces of white oak plank, each 24 feet long, 3 inches thick, and 8 inches wide, (laid 2 inches apart,) as shown in fig. 4 of sheet G, No. 21, 1,728 feet, board measure, of 3 inch white oak plank, = a.

IRON BOLTS AND SPIKES.

We shall assume the bolts in this case to be of wrought iron, round in form, and $1\frac{1}{2}$ inch in diameter. Iron of at least this strength will be required for all breakwaters placed some distance from the shore, and exposed to heavy shocks from the sea-waves against the sides of the cribs.

Bolts under water.

Pounds.

8. For the latticed bottom, (see fig. 1, sheet G, No. 21)—	
Thirty-one bolts, each 20 inches long, = 51.7 feet of round wrought iron $1\frac{1}{2}$ inch in diameter, weighing 5.972 pounds per lineal foot.....	308.8
Four bolts, each 30 inches long, (see a fig. 6,) = 10 lineal feet, as above.....	59.7

9. For the two outside longitudinal walls—	Pounds
33.6 bolts (or their equivalent) each 30 inches long = 84 lineal feet.....	501.6
10. For the middle longitudinal walls—	
The equivalent of 7.2 bolts, each 30 inches long, = 18 feet.....	107.5
11. For the three transverse walls—	
The equivalent of 33.6 bolts, each 30 inches long, = 84 feet.....	501.6
Total of wrought iron, of round form, $1\frac{1}{2}$ inch di- ameter for bolts for the first five feet of height above the soil at bottom.....	1,479.2 = g.
12. For each additional foot in height, under water—	
The equivalent of 20 bolts, each 30 inches long, = 50 feet.....	292.6 = h.

Bolts above the water surface.

	Pounds.
13. For the two outside longitudinal walls—	
The equivalent of 28.8 bolts, each 30 inches long = 72 feet.....	429.98
Twelve bolts, each 20 inches long = 20 feet.....	119.44
14. For the middle longitudinal wall—	
The equivalent of 14.4 bolts, each 30 inches long = 36 feet.....	214.99
Six bolts, each 20 inches long = 10 feet.....	59.72
15. For the three transverse walls—	
28.8 bolts, (or their equivalent,) each 30 inches long = 72 feet.....	429.98
Total of round wrought iron, $1\frac{1}{2}$ inch in diameter, for bolts for the 5 feet crib work above the water surface.....	1,254.11 = f.

Spikes of wrought iron.

	Pounds.
16. For fastening the 4 sleepers to the top timbers of the three transverse walls—	
Twelve spikes, each 15 inches long, of wrought iron $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square = 15 lineal feet, weigh- ing 0.475 of a pound per foot.....	7.1
Five hundred and four spikes for fastening the plank flooring to the sleepers, each 6 inches long, and $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square = 252 lineal feet, weighing as above.....	119.7
Total of wrought iron spikes $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square.....	126.8 = e.

HARD BOULDER STONE.

The four hollow compartments for receiving the stone ballast are, in this case, each $11\frac{1}{2}$ feet by 11 feet, giving for the area of a horizontal section, of each compartment126.5 sq. feet.
 Or, for the four compartments506. “

This, multiplied by 5 feet—

Gives, for the cubic contents of the four compartments 5 feet high, i. e., from the bottom to the surface of the water2,530. cub. ft.

17. Or, 93.70 cubic yards = i. ; which is the quantity of stone required to fill each crib to the water surface under this case.

18. The additional height of 4 feet, to bring the stone to the lower surface of the sleepers of the flooring, would require an addition to the above quantity, 74.96 cubic yards = $\frac{4}{5}$ i.

19. Each additional foot in height of the crib, will require an additional quantity of stone, under this case, of 506 cubic feet, or, 18.74 cubic yards = k.

The formula above given, for computing the quantity of materials for a crib of greater height, or for any required length of pier work, apply to this case as well as to cases 1 and 2.

In regard to the height to which the cribs should be filled with stone, it may be remarked that, in cases where the piers are exposed to a moderate action only of the sea, it will be sufficient to fill them to the level of the water surface ; but for *breakwaters*, and such portions of general pier-work as are exposed to the full force of the waves, the cribs should be filled with stone quite up to the sleepers, in order to increase the *vis inertiae* or power of resistance against motion, or disturbance in position from the action of those waves.

In cases where the cribs are built of the same description of timber, both above and below the water surface, the values of the terms *b* and *c*, in the foregoing formula, will be united in one term, say *b* ; then the equations for computing the quantities of timber required for a single crib of any height, or for a pier work of any length, will become :

$$t = a + b + (d \times n) \text{ and} \\ x = a + b + (d \times n) \times m.$$

I will now proceed to describe the operations upon, and the progress of, the works under my direction during the years 1854 and 1855 to the present date. They embrace the harbor works for Lake Michigan and Lake St Clair.

I.—LAKE MICHIGAN HARBOR WORKS.

1. CHICAGO HARBOR.

The operations for the improvement of this harbor during the business or working season of 1854 consisted in cutting a ship channel, by means of the steam-dredge, through the bar which obstructed the direct entrance of vessels, drawing more than seven feet water, and in repairing the machinery appertaining to this harbor preparatory to the repairs of the piers, lakeward from the point where they cease to be defended from the action of the sea, by the lake drift or accretion, this being the limit prescribed by the board of engineers, with the means available for this harbor.—(See the report of the board of September 1, 1854, in Senate Ex. Doc. No. 1, 33d Congress 2d session, part 2, p. 310.)

The accompanying map, marked G No. 11, projected on a scale of $\frac{1}{2400}$ or 200 feet to one inch, shows the condition of the bar across the proper entrance to Chicago harbor when I took my station here in April, 1854. It will there be seen that vessels coming from the northward and bound for this harbor, if drawing as much as nine feet water, were compelled to run down as much as 1,200 feet, or more than one-fifth of a mile, to the southward of the north pier-head, and then to double on a northwesterly course in order to reach the harbor. Vessels drawing as much as twelve feet, a depth which is now demanded for a large proportion of the vessels trading to this port, were then compelled to run down as much as two thousand feet, or nearly half a mile, to the south of the north pier-head, in order to double this bar. The course then being northwesterly to gain the harbor, or in the face of the wind which brought them to the southern extremity of the bar, compelled them to remain at anchor off this bar until the wind should prove favorable for them to come in, or until steam tugs could be employed to tow them in. This was a source of much additional risk to the vessels and of expense to ship owners.

On the 3d of May, 1854, I recommended to the bureau that the cutting of a channel through this bar should be commenced by the use of the steam-dredge, which had recently been completed for the United States, under a contract with Mr. D. S. Howard. This step was approved, and on the 18th of May the work was commenced, and continued every day that the direction and force of the wind would permit, (Sundays excepted,) until the 27th of June. On this day an accident occurred to the machinery, which checked the progress of the work until the necessary repairs could be made. These were not completed until the 5th of July. On that day the dredging was resumed and continued until the 22d of that month. Within these two periods 18,000 cubic yards of sand were removed from the bar, and warped out in scows, having drop bottoms, a distance varying from 2,500 to 3,000 feet and dropped into the lake, in water from four and a half to five fathoms deep, where the lake current was found to be strong enough to waft this sand so far to the south as to preclude its being washed back into the mouth of the river by the lake waves under an easterly wind. The opening of a ship channel wide enough

and deep enough to accommodate the crowded trade to and from the port of Chicago was now accomplished. I beg leave to refer to the accompanying chart, marked G, No. 12, on a scale of $\frac{1}{2400}$, or 200 feet to 1 inch, for full information as to the remnant of the bar, and the capacity of the channel through the main entrance, after the dredging was completed. The document hereto attached, marked A 5, issued as a guide to mariners for entering the harbor soon after the surveys for this chart were completed, will also show the facilities created by this dredging operation.

The cost of creating this new ship channel, and of warping the 18,000 cubic yards of sand into deep water in the lake, as above mentioned, was \$1,891 20, or 10½ cents per cubic yard, as was reported to you in my report, No. 32, of the 19th of August of last year. I beg leave to quote here the items of cost, as they were then reported, as follows, viz:

No. of voucher.	Items of cost.	Amount.
6	Manilla rope.....	\$32 20
8	Pay-roll.....	343 73
9	Painting signs.....	5 22
13	Pay-roll.....	223 75
15	Coal, for fuel.....	88 91
21	So much of this voucher for printed blanks.....	5 00
22	Implements.....	52 49
23	Pay-roll.....	85 12
24	Pay-roll.....	175 63
25	Clerk hire.....	15 00
28	Blacksmith's work.....	24 74
29	Labor in emptying scows.....	38 44
30	Pay-roll.....	204 75
31	American Express charges.....	3 50
33	Coal, for fuel.....	74 75
40	Repairing scows.....	292 95
41	Oil for steam engine.....	9 45
42	Pay-roll.....	201 00
	Total.....	1,891 20

$$\frac{189,120 \text{ cents}}{18,000 \text{ cubic yards}} = 10.506 \text{ cents per cubic yard.}$$

The total number of days included between the beginning and ending of the dredging on Chicago bar was..... 66

Of these, the number of working days was..... 36

Number of days employed in repairing broken crank, connecting-bar, and cylinder head..... 7

Number of Sundays..... 9

Number of days on which the dredging could not go on, owing to bad weather or too heavy a sea on the bar..... 14

Total..... 66

The quantity excavated and removed by each day's work is given in the accompanying statement, marked A 6.

I have been thus minute in the details respecting the cost and time required to remove this bar, because it appears to me important to compare them with what would be required to construct a counter-pier in the lake, oblique to its shore current from the north, for the purpose of increasing the velocity of this current sufficiently to waft the silt to the southward of the entrance of the river, and thus prevent the formation of any obstructing bar whatever. Without entering, at this time, into any discussion as to the probable effect of such a counter-pier upon the character of the harbor entrance, I will remark that the cost of such a work, alone, renders the experiment, in my opinion, less advisable than a resort to dredging for a few weeks of each season.

In order to produce a sufficiently increased current, such a counter-pier should present an angle not greater than about forty degrees with the direction of the prevailing shore current of the lake, whose direction is from about northnorthwest; and, to make it effective, it could not be less than 1,500 feet in length. This would place it in water of twenty-five feet average depth, and would require it to be at least thirty feet wide, and thirty-five feet high above the bottom. Let us suppose the work to be divided into fifty cribs of thirty feet each in length. One of these cribs would cost at least \$5,000 to complete it, sink it, and fill it with large boulder stones, the only kind that would be admissible where so strong a current and so powerful a sea would be encountered.

Fifty cribs, at \$5,000 each, would be \$250,000 for the cost of the work.

The interest on this sum would be, at 6 per cent. per annum	\$15,000 00
For necessary repairs, at least $2\frac{1}{2}$ per cent. per annum...	6,250 00
Total annual expense of counter-pier.....	<u>21,250 00</u>

Let us compare these sums with the first outlay and current expense necessary to insure, by dredging, a constant ship channel across this bar, 800 feet wide, with not less than 13 feet depth of water.

The capital to be laid out in constructing and equipping a steam-dredge of the first class will be \$17,500.

The interest on the above sum, at 6 per cent. per annum, is.....	\$1,050 00
Allow for deterioration and necessary repairs, and additional rigging, (as the same shall be worn out by use,) the liberal sum of 10 per cent. additional on first cost.....	1,750 00
Current expenses of working the dredge on the bar and in the channel of the river, per annum.....	2,500 00
Total annual expense of dredging.....	<u>5,300 00</u>

The last mentioned sum would keep the dredge employed during two periods of each year, of two months each, say during April and May, and again from the 15th of August to the 15th of October. It is believed that even a less period of work would keep the bar subdued, and constantly insure a free and open ship channel full 13 feet deep, and 800 and 900 feet wide, besides keeping the river within the city limits cleared of shoals. The comparative expenses of the two methods of improvement are, then, as follows:

<i>Cost by dredging.</i>		<i>Cost by a counter-pier.</i>	
1. Original outlay	\$17,500 00	1. Original outlay	\$250,000 00
2. Annual expense	5,300 00	2. Annual interest and repairs	21,250 00

I would, therefore, recommend that, for several years to come, at least, the dredging should be resorted to in preference to any consideration of a counter-pier. With careful observation of the direction and force of the lake current near the mouth of the river, and experience from dredging for a few seasons, we should be enabled with more safety to decide whether it would be advisable to admit a counter-pier at all, for the object under consideration.

A breakwater, at some future day, placed southward of the river entrance, and parallel with the lake shore, to afford a safe anchorage and roadstead for the relief of the over crowded river, is another subject which may hereafter be presented.

The accumulation of sand at the main harbor entrance is known to be greater during the winter than at any other season. It is no doubt owing to the following causes:

Although the great depth of Lake Michigan keeps up the general temperature of its immense water prism sufficiently to prevent a freezing over of its surface, yet the ice accumulates, in large bodies, in the shoal water near the shores. When the wind blows towards the shore this ice is driven, in large bodies, into the mouths of the rivers tributary to the lake. A barrier is thus formed which resists the force of the lake waves. A sudden check of velocity causes these waves to deposit a portion of the silt they had held in suspension upon the upper surface of this stratum of ice. By repeated accumulations of silt, in this way, the superincumbent weight becomes sufficient to sink the whole mass to the bottom. There it rests, together with numerous other strata which, with their superincumbent loads of silt, are sunk, one upon another, until the channel is obstructed by the combined masses of ice and silt.

In the spring of the year, when the increased temperature of the water causes the ice to melt, the silt is dropped to the bottom, which, combined with that constantly deposited by the usual lake shore current, causes a greater accumulation of silt to obstruct the harbor entrance in winter than at any other season.

It would appear, then, that by an immutable law of nature this constant deposit, tending to obstruct this harbor entrance, must go on. In order to counteract this effect, the first question which arises is: can we, within a reasonable expense, after the bar is first cut

away, remove this deposit faster than it can accumulate, and thus keep the ship channel open during the season of navigation?

In answer I would say, that I conceive this problem has already been solved in the affirmative by the dredging out a sufficient ship channel for Chicago harbor, as has been shown above, by the work done in two months, viz: between the 18th of May and the 22d of July, 1854, wherein there were but 36 working days, and at a current expense, all items included, of only \$1,891 20.

I was very desirous, in connexion with this problem, that an accurate survey of this bar should be made on the first opening of navigation in the spring of 1855. So severe, however, had been the preceding winter, that the river was not open and free from ice until the last of March, and even then the weather continued so boisterous that no accurate soundings could be made earlier than the 28th of May. Between this period and the 6th of June the soundings shown on the accompanying map of Chicago harbor, called "map G No. 22," were made. The continued roughness of the season, even up to the middle of July, constantly baffled the attempts that were frequently made to multiply accurate soundings on the bar to a greater extent than they are shown on this map. Sufficient, however, is there shown to demonstrate the theory above set forth, that the period for the greatest accumulation of deposit to form a bar at the harbor entrance is the winter. In order to prosecute this investigation still further, another accurate survey was made of Chicago harbor between the 24th of September and the 12th of October, 1855. The result of that survey is shown by the accompanying map, called "map G No. 23." The soundings were here multiplied to the desired extent, as there was a short period of calmer weather at that time. For the triangulations and surveys upon which these two maps are based, I am indebted to the labors of my first assistant, William M. Graham, (now a lieutenant in the first regiment of artillery,) and second assistant John R. Mayer. These surveys, as far as they extend, give the first accurate map of Chicago that has ever been made, and correct many errors heretofore existing in the assigned positions of important public buildings, such as the City Hall, the Marine Hospital, churches, &c., whose domes and steeples are useful guides to vessels for entering and clearing the harbor. They also correct important errors in the directions of streets, the contour of the river, &c.

Notwithstanding the excellent ship channel that had been secured by dredging in the summer of 1854, as shewn on "map G No. 12," a comparison of "map G No. 11" with "G No. 22" shows that the bar formed again to such an extent between the closing of navigation in December, 1854, and soon after the opening of it again at the end of May, 1855, as to bring it, at the last mentioned date, in very nearly the same condition that it was in at the last of April, 1854.

In April, 1854, vessels drawing over 7 feet water could not cross the bar opposite to the mouth of the river. In the summer of that year full 12 feet could be carried over, owing to the dredging. Again, in May and June, 1855, from $7\frac{1}{2}$ to 8 feet only could be carried over opposite to the mouth of the river.

Map G No. 23 shews that the bar was very nearly in the same con-

dition in the latter part of September and the early part of October, 1855, that it was in May and June of the same year. It seems, indeed, that it had deepened from half a foot to a foot, in some places, between those two periods.

The season was a very boisterous one throughout, and the action of the sea had probably forced a portion of the sand from the crest of the bar into the mouth of the river. I would advise the engraving of all these maps to their full extent without any reduction in scale. It is very important that these topographical statistics of the harbor and river should be procured with every practicable accuracy for several consecutive seasons, and carefully preserved, because they must constitute the chief reliable data from which any modified plan for perpetuating the effect of the desired improvements can be deduced. The soundings on maps G, 11, 12, 22 and 23, are all reduced to the plane corresponding to a reading of $2\frac{2}{10}$ feet on the tide-gauge.

It is much to be regretted that there is not a first class steam-dredge belonging to Chicago harbor. It would suffice to keep the channel constantly open, besides having spare time to do a great deal of other work essential for the improvement of the city; and it would be the means of saving immense sums of money every year to the commercial community, and many human lives from loss by the wrecking of vessels. The losses of shipping and other property to the value of several hundred thousand dollars, during the last season alone, might have been prevented by the use of such a machine properly managed. I have, therefore, added to the estimates for this harbor, herewith submitted, an item of \$17,500 for the building of a steam-dredge boat and scow. I would earnestly recommend that it be constructed under the direction and supervision of this office, and not by contract; for experience has shown that government work of this kind done by contract is too often slighted to the detriment of proper efficiency. Should this recommendation be adopted, there would be no difficulty, with the sum above mentioned, in building at a convenient point on this lake a steam-dredge boat and appurtenances of the greatest dredging power required, and by a model that would insure a locomotive power and velocity of ten miles per hour, or that would enable her to tow the four sand scows that must attend her dredging operations from one harbor to another whenever required.

At present, the United States have but one dredge boat for all the harbors on Lake Michigan. She cost, together with her four scows, the sum of eighteen thousand eight hundred dollars, (\$18,800.)

Her locomotive power does not exceed six miles per hour, and her model and engine, although good for dredging, are such that she is unable to tow her four sand scows with safety, when required to move from one harbor to another. This has always been done by the hire of towing vessels.

This machine, after dredging out Chicago harbor last year, was sent to dredge in the harbor of Racine, where it was employed until the close of that season.

So soon as the weather had become sufficiently mild, after the opening of the spring of the present year, it commenced the dredging out of Kenosha harbor, and was thus employed until the 8th of Septem-

ber. From that date until September 18, it was employed in assisting to raise a valuable pile-driver and crane scow which lay sunk under the water in Kenosha harbor.

So soon as this was accomplished, notice was given to the board of trade of Chicago that this steam-dredge was ready to come to said city to dredge out the north channel over the bar as soon as the board could make arrangements with the proper steam vessel to tow her sand scows to this place, in pursuance of the arrangements shown by the accompanying correspondence, marked A 8 and A 9. I found that (owing to the absence of Mr. J. C. Nyman, the member of the board of trade charged with the arrangements) no towing vessel had been engaged as late as the 25th of September; and feeling extremely anxious that a safe passage for shipping through this channel should be secured during this period of active commerce, I adopted myself every means within my power to engage a towing vessel for the purpose.

My instructions to Assistant Robert M. Miller, of September 20, hereto attached, marked A 10, show that every preparation within the power of this office had been made.

On application to the agent for the Collingwood line of steamers, I received from him the accompanying letter, marked A 11, and, fully expecting the business would be accomplished by the measures kindly tendered by him, I at once telegraphed Assistant Miller, as per A 12, dated September 26. Unfortunately the weather was rough when the "Keystone State" passed Kenosha, and she was too heavily laden to take the scows in tow without great risk of losing them.

The next steamer to pass was the "Cleveland," but she was detained from having some part of her machinery injured, so that there was another disappointment from causes not to be foreseen or prevented.

On the 28th, while on my way to Kenosha to attend to the urgent business detailed in my report No. 102 to the bureau, Mr. Nyman overtook me at the Chicago and Milwaukie depot, and informed me that the board of trade would undertake to attend to all necessary arrangements in regard to the towing of the scows, and that I might expect a steamer to call for them the following day. Hence it was that I called so strenuously upon the mayor and common council of Kenosha, as is shown by the correspondence accompanying my said report to the bureau, No. 102, dated October 6, 1855, to loose their unlawful hold of a portion of this property, which they had seized by force under the pretence that it belonged to the city of Kenosha.—(See under the head of Kenosha harbor, C 5 to C 25, inclusive.)

No towing vessel having been procured as late as October 10, I addressed the board of trade in writing on that day, as per the accompanying letter, marked A 13. By their reply (A 14) of the same date, I was informed that the board had determined to defer the dredging until next spring. This I regretted, as there was still a hope of our being able to improve, materially, the harbor entrance before the close of navigation, because the period of *Indian summer*, as it is called, is often a calm one on this lake; and I continued my own personal efforts to get the dredging scows to Chicago. The result was fully communicated to the bureau in my report No. 109, of the 31st of October last.

I have been thus minute because I desire that my efforts in behalf of this harbor should be properly understood.

Repair of Chicago piers.

My report, No. 32, of the 19th of August of last year, was accompanied by an estimate of the cost of repairing these piers above the low water level of the lake with *white oak timber*, for the reason that the balance of the appropriation remaining for this work was entirely insufficient for making the repairs with stone masonry. On September 27 I received your letter of the 19th, communicating the approved report of the board of engineers thereon, dated September 1, which says: "The proposition of Lieutenant Colonel Graham to repair the piers at Chicago above the water level with oak timber meets the approval of the board for that portion of each which lies beyond the protection given by the accumulation of lake drift. It will be time enough, in the opinion of the board, on the completion of these repairs, to consider the propriety of extending them throughout."

I immediately advertised for proposals for furnishing the necessary timber and bolt iron, in order, if possible, to commence these repairs, as far as authorized, before the setting in of winter. Bids were not, however, received until November, and the lowest were at rates so far beyond the usual prices that I was compelled to reject them. They would have rendered the funds on hand, applicable to this object, insufficient for its accomplishment.

Since that period the lake drift, or accretion on the shore, has extended that shore out, lakeward, full one hundred feet, so that the sea cannot now break over that portion of the pier which is much decayed, so as to threaten a breach. The part of the north pier which most requires attention is its eastern extremity. The eastern extremity of the south pier also requires attention. Both would have been attended to in October and November last, but for the loss of the floating pile-driver reported to the bureau in my report No. 109 of October 31, 1855. This machine was essential to the operation, which must now be deferred until the ensuing spring.

I would now recommend that these piers be repaired by substituting stone masonry in lieu of the present decayed timber work, from a plane one foot below the low water level of the lake surface to a height of 5 feet above the same, making a total height of 6 feet of masonry.

There are quarries in this vicinity, communicating with the city of Chicago by canal, which furnish an excellent, compact, blue limestone, well suited for this purpose. A sufficient supply can be readily obtained for the face work, of stretchers and headers, that will dress to the dimensions of 6 feet by 4 feet, and 12 to 15 inches thick. Such a block, if 15 inches thick, would weigh 5,460 pounds, or 182 pounds, per cubic foot.

I would recommend that this masonry be laid in the manner shown, for the first or lower stratum, by the accompanying drawing, marked G No. 24.

Here it will be seen that it is proposed to build up both the lake and river faces with the stone blocks, 6 feet by 4 feet, and 12 to 15 inches

thick, by laying them in each stratum alternately, longitudinally, and transversely of the direction of the piers, that is to say, by a regular alternation of stretchers and headers of like dimensions; these blocks to be dressed with the hammer with sufficient accuracy to insure fair bearings and close joints. The intermediate space between these face walls to be filled with stone as it comes, in sufficiently large blocks, from the quarry, without any other dressing than such occasional hammering as may be necessary to insure good and safe bearings. The blocks in each successive stratum or course to be so laid as to overlap or break the joints in the preceding one. The course that will rest entirely below the water surface to be laid in hydraulic cement; the others, or superincumbent courses, to be laid in mortar composed of one barrel of common lime to two barrels of hydraulic lime, and the usual proportion of sharp sand.

The portion of the north pier which is so much decayed above the water surface as to require to be thus repaired in masonry is that included between the point marked G, (sheet G, No. 22,) being the first angle which occurs in that pier in proceeding from its western towards its eastern extremity and the point marked L, which is the point where the lake shore is, at this time, met by this pier. This distance, G L, is 1,510 feet. I call it, here, section 1 of the north pier.

Section 2 extends eastward from L to M, a distance of 377 feet. Section 3 extends from the point M to the eastern extremity of the north pier head, a distance of 144 feet. The timbers above water on sections 2 and 3 being generally sound, although ruptured in several places from the action of the lake waves, the overloading of the piers by placing heavy weights upon them, and the battering of vessels running unavoidably against the pier-head, it is proposed, for the present, to repair these two last mentioned sections with good oak timber. It will save expense, and these sections will then probably remain sound for several years to come.

The timber work above water of the south pier is all very much decayed. I recommend that this pier be repaired with stone masonry from its present eastern extremity to the eastern limit of the opening, granted, under certain specified conditions, (see A 15 and A 16,) to communicate with the basin of the Illinois Central Railroad Company. The length of this portion is 908 feet. It would not be advisable to incur any expense in repairing the remaining or western portion of this pier, as it must soon be entirely destroyed and a new south shore line be given to this part of Chicago river by the excavation to be made by the city authorities under the grant made by the act of Congress of July 21, 1852.—(See map G, No. 17, herewith submitted.)

I am not now prepared to recommend an extension of the south pier eastward of its present limit. The action of the lake counter-current, from the south, seems to preserve a good depth of water to the south and east of the extremity of this pier, as will be seen by reference to the charts G Nos. 12, 22, and 23. I would prefer the benefit of another season's observations before recommending anything decided upon this point.

I submit herewith an estimate marked A 17, of the amount of appropriation that will be required for the repairs above recommended,

including machinery, office rent and contingencies, and the expense of a new survey of this harbor based upon an extended triangulation, which will be required on the opening of the ensuing season of navigation, in order to show, again, the changes that will have been produced, during the ensuing winter, in the character of the main ship channel and the bar, from the effect of the barricade of ice, and the action of the lake waves in causing a deposit of silt. It is only by correct surveys of these lake harbors, made at stated periods, that we can expect to gain an accurate knowledge of the law of nature by which they are affected.

This estimate, exclusive of the balance of the former appropriation remaining unexpended the 31st December, 1855, amounts to *one hundred and thirty-eight thousand five hundred and sixteen dollars and sixty eight cents.*

The present dilapidated condition of the Chicago piers is no doubt owing chiefly to the effect of time in causing a decay of the timber work above water, from the natural effect of atmospheric action. It cannot be concealed, however, that this injury has been much aggravated by the illicit practice of piling upon them heavy weights of lumber, stone, bricks, iron, coal, wood for fuel, &c.

In many instances the cross-ties which were still sound, have been broken down, together with the upper flooring, by these excessive weights, and the whole pier structure, above the water surface, much damaged. On examining the records of this office, soon after I took my station here, I found these practices prohibited by your instructions (to my predecessors) of May 29, 1847, and August 31 and September 3, 1849, (see A 18, A 19, and A 20.)

Under these instructions, the duty devolved on me of protecting the piers from such trespasses. This I endeavored to do by a kind and conciliatory course, as far as was practicable without a surrender of the jurisdiction and authority of the United States government over the piers. By most persons, the rules enjoined for the preservation of these works were respected, but there were instances of attempts either to evade the rules or openly to resist them.

In order to give full warning to all concerned, and at the same time not to deny reasonable facilities for the progress of business in cases of apparent necessity for crossing the piers, the notice contained in, the paper hereto appended, marked A 7, was, on the 15th of August 1854, published in several of the newspapers of Chicago, and extensively distributed in printed placards. By these steps, and special warnings that actions for damages would be brought in case of further trespass, the evil has been much diminished, but not entirely cured.

It is certainly an evil not to be permitted, that public works, erected for the benefit of the general commerce of the United States, through the liberal appropriations made by Congress from the public treasury, should be thus abused, with impunity, by a few evil disposed persons. I would therefore recommend that Congress be solicited to enact a penal law defining the punishment to be awarded, in future, for similar trespasses upon any of these public works, wheresoever situated. I believe it is only in this way that the evil can be effectually cured.

If continued it must tend to bring the whole system of harbor improvements into odious disrepute.

The line, which is the limit, to the south, of the excavation of a portion of the Fort Dearborn military reservation, authorized by the act of Congress of July 21, 1852, for the improvement of the navigation of Chicago river, has been definitively settled and marked out under the direction of this office; also the lots in said reservation which were granted to Jean Baptiste Beaubien by the act of August 1, 1854. These duties were performed by the especial directions of the Secretary of War, hereto attached, marked A 21 to A 26, inclusive.

Difficulties arose, in my first attempt to mark out this limit of excavation, from its having been erroneously marked on the map which accompanied a deed of sale of a portion of the Fort Dearborn reservation to the Illinois Central Railroad Company, executed by the late Secretary of War, (Mr. Conrad,) bearing the seal of the War Office, and dated the fourteenth of October, 1852. A copy of the deed, and a copy of the map which is attached to it, are herewith presented; the first marked A 27, and the second marked map No. 25. On this map the limit of the excavation is represented as being a straight line, beginning at the point of intersection of the southeast shore of Chicago river, with the prolongation, to the northwest of the line of demarcation between lots 7 and 8 of block 2, and running thence through the centre of the light-house, and terminating at the interior angle in the United States south pier.

In attempting to lay down this line, as it is represented on map No. 25, it was found that these three points are far from being in the same straight line.

A straight line beginning at the first mentioned point, and passing to the eastward through the centre of the base of the light-house, would pass full fifty-seven feet to the north of the interior angle of the south pier. This extraordinary discrepancy between the guiding points, as laid down on the map, compared with their actual positions on the ground, induced me to look to the law, in hopes of finding therein a definite description of this line.—(See the law hereto attached, marked A 28.) The only description of the line there given is contained in its first section, which is as follows, viz:

Be it enacted, &c., "That the corporate authorities of the city of Chicago, Illinois, be, and they are hereby, authorized to excavate such portion of the reservation at Chicago, not exceeding the limits described in their memorial of January five, eighteen hundred fifty-two, as may be necessary, according to the plan set forth in said memorial, for the improvement of the navigation of Chicago river." The law, it will be seen, depends entirely upon the memorial of the corporate authorities of the city of Chicago, and the map or plan which accompanied it, for a definite understanding of this line. These documents were therefore next sought as sources of information, and were found filed in the clerk's office of the city council of Chicago. They are hereto attached, the memorial marked (A 29, or) a, and its accompanying map or plan, marked (G No. 26, or) A.

The only description of the line, given in the memorial, is contained in its last paragraph, as follows, viz:

“Your memorialists, therefore, pray Congress to pass an act authorizing the city of Chicago to make the said improvement as per the ‘red line’ marked on the accompanying map.”

These guides only tended to increase the embarrassments attending the case, for, on reference to the map (A) (G No. 26, hereto attached,) which is the only exponent of the meaning of the memorial and the law, we find *two red lines* and one *blue line* there laid down. The blue line could not be regarded as the limit of the excavation, because such a construction would not be in accordance with the law, but in direct opposition to it. Notwithstanding this, we find the blue line designated in writing, on map A, as the “line of proposed excavation.” It is the same line which is also thus designated on the map, (No. 25,) which is attached to the deed of sale of October 14, 1852.

These difficulties were reported to the War Department, (see A 22,) and further instructions asked for. They were issued on the 10th of April last, (see A 23,) and under the authority therein contained, and after several conferences with the parties in interest, the line was definitively settled and marked upon the ground, as shown on the accompanying map, called “map G No. 17,” and as described in my report to the War Department of the 26th of September last, (see A 26;) and it was duly consented to and ratified by all the three parties in interest, as shown by the document marked D, which accompanied that report, and is hereto attached.

This line, which is to give a new shore on the south to a portion of Chicago river, while it will render the turns in the river easy for shipping, preserves a uniform width of not less than 200 feet for the navigable channel, and secures, for the accommodation of general commerce, the whole of River street, which the most southern red line of the memorialists’ map (A) would have almost entirely destroyed. Another advantage to commerce is, that the northern margin of that portion of River street which runs east and west will coincide with the margin of the river, and thus, by precluding the interposition of buildings between the shore and that street, will afford valuable facilities for discharging cargoes from the shipping. The most northern red line of map A would have left a very narrow strip of land between River street and the shore of the river, not wide enough for building lots, but which would have cut off from the shipping the facilities of discharging their cargoes upon the northern margin of this street. The turns in the river, being upon circular arcs of large radii, are much easier than they would have been had either of the lines on the memorialists’ map been adopted. The portions of lots 8 and 9 of block No. 2, granted to J. B. Beaubien by the act of August 1, 1854, (see A 30,) contain 6,180 square feet, as the line of excavation (which is one of his boundaries) has been established. By the southern red line of map A, these lots would have contained only 4,160 square feet, and by the northern red line of that map they would have contained 6,659 square feet.

I am authorized to say, that each and all of the parties in interest prefer the line as it has been established to either of the lines drawn on the map of the memorialists, while the interests of commerce, generally, are much benefitted by it.

In determining this limit for the intended excavation, it has been done with an earnest endeavor to carry out what was believed to be the true intent of the law. The law is ambiguous, from its having adopted the map of the memorialists as the only description of the line, which map, it will be seen, is itself entirely indefinite and perplexing.

It has also been determined, in unison with what we believe to be the best practicable mode of continuing the improvement of the navigation of Chicago river, beyond the limit of the public grounds to the southwest, as will be best understood by an inspection of the dotted lines on "map G No. 17."

It will also there be seen that provision is made for a ship basin on the north side of the river, opposite to the line of excavation, of a maximum width of 130 feet, and an area of 8,290 square yards, and with an opening to the east of 50 feet in width for the ingress and egress of vessels.

It is recommended that this basin be formed by the construction of a pier ten feet wide, to consist of solid crib work to be filled with stone, to rise from the bottom of the river to a height of five feet above the river surface at high water, and that it shall have a water-tight junction with the shore at its western extremity, so as to confine the current of the river entirely to the channel, 208 feet in width between the proposed basin-pier and the south shore.

If this basin were left open at both ends, the current would pass, in its greatest force, between the pier and the concave or north shore of the river; hence it would become suspended or much slackened near the opposite or south shore, and the silt would be deposited so as to form an obstructing bar where the excavation is now proposed to be made.

Such a basin would afford great relief to the general commerce of the lakes trading with Chicago, and greatly diminish the damage to vessels, which is daily occurring from the overcrowded shipping, and consequent collision in passing in and out of the harbor.

Since the 1st of September, 1854, up to the present time, (December 31, 1855), a daily register has been kept of the height of the surface of the water of Lake Michigan. This has been done by observations upon a tide-gauge, erected at the north pier-head of Chicago harbor, upon the plan of Major Hartman Bache, of the corps of topographical engineers, to whom I am indebted for it. It is the same which he has used upon many of his valuable hydrographic surveys on the Atlantic border. The result of these observations is given in the tabular statement hereto attached, marked A 31, and also in the graphic profiles, found among the maps, marked G No. 37. In erecting the tide-gauge, care was taken that the zero (0) mark should be immersed so low in the water that the lake surface would not, in a long series of years, probably fall below it.

In order to preserve permanent references to the horizontal plane corresponding to the zero (0) of this tide-gauge, offsets were made with an engineer's levelling instrument to the following permanent objects, whose heights above the horizontal plane of that zero (0) were found to be as follows, viz:

1. The surface of the stone base on which the pilasters of the stone

masonry basement at the northwest corner of the United States Marine Hospital rest, 12.83 feet.

2. The top of the stone coping which surmounts these stone pilasters, 19.33 feet.

3. The upper surface of the stone sills of the basement windows on the west or main front of this hospital, 13.92 feet.

4. The highest point of the upper surface of the stone basement wall on which the iron railing rests, at the northwest angle of the enclosure around this hospital, 14.83 feet.

5. The top of the coping of the west extremity of the brick wall which encloses the hospital grounds on the north side 30.33 feet.

The soundings in maps G Nos. 11, 12, 22, and 23, are reduced to the horizontal plane corresponding to the reading of two feet and two tenths (2.2 feet) on this tide-gauge and on the graphic profile herewith presented, in five parts, marked G No. 37. This was the mean height of the lake surface when the gauge was erected the 1st of September, 1854. I must observe, however, that the average height of the lake surface is now about five tenths of a foot greater—the average reading on the tide-gauge being now 2.7 feet—than it was when this tide-gauge was erected, owing, no doubt, to the increase of supply, by drainage, in comparison with the evaporation from the general lake surface.

It is known, from general observation, that there is a fluctuation in the elevation of our great western lakes of three or four feet in a period of from six to ten years, owing chiefly, as I believe, to the above mentioned causes. It is to be regretted that exact daily observations upon these fluctuations have not been carried on for many years past, as without their aid the law of this phenomenon will continue to be merged in many a vague and fruitless speculation.

Besides these fluctuations, which occur at long intervals of several years, there are others which occur frequently in a single season, causing the surface of the lake to rise suddenly several feet in the space of a few minutes, and then to become as suddenly depressed. One of these sudden fluctuations is recorded in the tables, and on the corresponding profile for the 27th of June, 1855, produced, no doubt, by a sudden gale of wind from the southwest, which, passing over the heated surface of the great prairie plains, caused a column of highly rarified atmosphere to pass suddenly over this portion of the lake surface. The greater pressure of the more dense atmosphere surrounding this rarified prism would act barometrically to produce the sudden rise within the whole surface of its base, which the table shows. The sudden rush of this more dense atmosphere towards the rarified prism to restore the equilibrium, which must under the pneumatic law take place, would cause the surface of the lake to fall as suddenly to its usual height. There can be no doubt, I think, as to the cause of this phenomenon. The mechanical force of the wind, alone, would have tended to produce the contrary effect, since, being from the southwest, and blowing a gale, it would have driven the water from this shore rather than to have accumulated it there. It will be seen that the greatest height was recorded at two o'clock p. m., and that in fifteen minutes thereafter the surface of the lake had fallen one foot and four

tenths. The observer had quit the tide-gauge at noon, (the usual hour of his daily record,) and it was only on seeing the rush of water upward in Chicago river that he was admonished to repair to the gauge, which was at a distance of one-third of a mile from his usual residence. We cannot, therefore, say how short was the time occupied in the rise from the usual height of 2.25 feet on the tide-gauge, to that of 4 feet, as recorded at 2 o'clock p. m.,

The phenomenon was, however, witnessed by myself, and its effect on the surface of Chicago river, at Fort Dearborn, was duly noted by another tide-gauge, consisting of a graduated staff, which I had erected at the "Free Ferry."—(See map.) Here the fluctuations were of much greater scope than those noted by the gauge at the north pier-head, extending to a difference of near 4 feet between the greatest and least reading on the staff in a space of time of ten minutes. The rise was, as a matter of course, greater in the narrow bed of the river than it was upon the lake surface, because the rush into the former from the broad expanse of the latter would, by mechanical impetus, force the accumulated body of water up an inclined plane to an elevation, while continued in motion, above the level of the lake surface.

A similar phenomenon was witnessed by myself on the 15th of the same month, (June, 1855.) While standing on the south shore of the river at Fort Dearborn, at 6 o'clock p. m. of that day, there being a very light air from the south, the water suddenly rushed up the bed of the river to a height of two feet above its usual level for that day, and as suddenly rushed back again. The whole phenomenon did not occupy a longer space of time than ten minutes.

These observations lose much of the value that should be attached to them, from not being accompanied by records of the state of the barometer, thermometer, the exact force of the wind, &c.; but I was not supplied with the instruments necessary for these observations, and can only, therefore, present them in their present imperfect state. The cost of a complete set of meteorological instruments, to be observed upon at this harbor, is included in the accompanying estimate, marked A 17, amounting to \$232 50.

The present vast extent and rapidly increasing growth of the commerce of Chicago renders it a matter of absolute necessity, in which not only Illinois, but also a number of her neighboring States are deeply interested, that her harbor should be kept in the best and most secure state of improvement, so as always to afford, during the season of navigation, a safe and easy entrance and departure for vessels drawing at least twelve (12) feet of water.

The States which are thus directly interested on account of a direct intercommunication of commerce with the port of Chicago, are New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, and Wisconsin, and also Minnesota Territory. The shores of all these are washed by either Lake Michigan or the other great lakes with which Chicago has a direct and very extensive commerce through the St. Clair flats. The other States and Territories which do not reach to the great lakes, but which are, nevertheless, greatly interested in the preservation of Chicago harbor, are Iowa and Missouri, and Nebraska and Kansas. A very large portion of the wheat and other grain produced in these

last mentioned States and Territories will be brought by railroads to the port of Chicago, to be shipped thence to the eastern Atlantic markets. This destination will generally procure, for the agriculturist, better prices and a quicker sale than any other.

In my report to you marked No. 30, of July 30, 1854, on the subject of the new lighthouse proposed for this harbor,* it was shown that the amount of duties on foreign importations, paid at the office of the collector of customs here, during the fiscal year included between July 1, 1853, and June 30, 1854, was \$334,043 98.

Many intelligent persons, not close observers of the enterprise and increasing commerce of Chicago, then expressed the opinion that the annual revenue from this source would not again, for many years to come, be so great.

It will be seen, however, from the following statement of receipts from the same source, for the year beginning January 1, 1854, and ending December 31, 1854, that they amounted, during the twelve months of the year 1854, to the sum of \$577,160 93.

For the month of January.....	\$9,042 07
“ February.....	7,001 44
“ March.....	20,511 73
“ April.....	24,590 04
“ May.....	32,404 13
“ June.....	40,368 61
“ July.....	52,143 33
“ August.....	112,453 25
“ September.....	43,238 00
“ October.....	78,988 35
“ November.....	53,551 75
“ December.....	102,868 23

Total for the twelve months of 1854.....	577,160 93
--	------------

During the twelve months of the year 1855, the amount of duties collected from the same source at Chicago, was, (see A 33)—

For the month of January.....	\$26,460 19
“ February.....	9,099 90
“ March.....	4,972 30
“ April.....	40,212 17
“ May.....	33,036 15
“ June.....	17,358 10
“ July.....	51,051 80
“ August.....	21,301 60
“ September.....	25,830 40
“ October.....	22,017 40
“ November.....	27,400 15
“ December.....	16,207 85

Total for the twelve months of 1855.....	294,948 01
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*See document marked A 32, hereto attached, and also the drawings marked G Nos. 5, 6, 7, 8, and 9, herewith presented, and referred to in that document. J. D. G.

Let us go back as far as the year 1853 in our statement of the revenue paid into the general treasury of the United States from custom-house duties on foreign importations received at Chicago, and it will stand as follows :

For the 12 months of the year 1853.....	\$261,284 66
For the 12 months of the year 1854.....	577,160 93
For the 12 months of the year 1855.....	294,948 01
Average for the last three years.....	377,797 86

The great excess for the year 1854, over 1853 and 1855, is due to the greater amount of railroad iron imported into Chicago during 1854.

The amount of duties on railroad iron alone, imported into Chicago during the three years above mentioned, is as follows :

For the 12 months of 1853.....	\$343,849 60
For the 12 months of 1854.....	549,378 44
For the 12 months of 1855.....	251,320 86

Hence the revenue derived from all other articles than railroad iron at Chicago, during those three years, was as follows :

For the 12 months of 1853.....	\$17,453 06
For the 12 months of 1854.....	27,782 49
For the 12 months of 1855.....	43,627 15

I am indebted to William B. Snowhook, esq., late collector, and to Philip Conley, esq., the present collector for the port of Chicago, for the above statements, taken from their official books. They will be found to correspond with their returns made to the Treasury Department at Washington.

The amount and value of the foreign and domestic commerce of the port of Chicago, during the year 1855, are shown in detail in the accompanying statements, marked from A 34 to A 39, inclusive.

Their values in money are as follows :

IMPORTS.

1. By lake shipment, as per statement A 34.....	\$100,752,304 41
2. By the Illinois and Michigan canal, statement A 35.....	7,426,262 35
3. By railroads, see statement A 36.....	88,481,497 90
Total value of imports in 1855.....	<u>196,660,064 66</u>

EXPORTS.

1. By lake shipment, as per statement A 37.....	34,817,716 32
2. By the Illinois and Michigan canal, statement A 38.....	79,614,042 70
3. By railroads, see statement A 39.....	98,521,262 86
Total value of exports in 1855.....	<u>212,953,021 88</u>

Aggregate value of the imports and exports at Chicago during the year 1855, \$409,613,086 54.

Of the above valuation of \$409,613,086 54, the valuation of the

articles which passed in vessels over the St. Clair flats, in shipments to and from Chicago, alone, in the year 1855, amounted to \$113,700,248 89. This will be seen, in detail, by reference to statements N 38 and N 39, hereto attached, under the head of "St. Clair flats improvement."

The value of the wholesale mercantile business of the city of Chicago for the year 1855, as appears by statement A 40, was \$50,186,000.

The accompanying statement, marked A 41, shows that the value of the tonnage which arrived at the port of Chicago in the year 1855 was (at \$35 valuation per ton) \$42,462,035. The amount of tonnage thus arriving in 1855 was 1,213,201 tons.

The number and names of vessels, of different classes, actually owned by Chicago merchants and masters (employed in active commerce) on the 31st of December, 1855, is shown in the accompanying statement, marked A 42. The amount of tonnage is 31,108 $\frac{5}{9}$ tons. The value of this tonnage, belonging exclusively to the port of Chicago, at the low valuation of \$35 per ton, amounts to the sum of (see A 42) \$1,088,801 74.

The amount of hospital fees collected from the lake seamen at the port of Chicago, as shown in statement A 43, was as follows, viz:

In the year 1854.....	\$1,393 68
In the year 1855.....	1,753 07
Increase for 1855 over 1854.....	359 39

The accompanying statement, marked A 44, shows the quantity and value of foreign merchandise received at the port of Chicago from foreign countries, in American vessels, in the year 1855, amounting to \$55,392 82.

Statement A 45 shows the quantity and value of foreign merchandise received in foreign vessels, from foreign countries, at the port of Chicago, in the year 1855, amounting to 225,826.

Chicago is the chief port of entry for foreign importations of this collection district. There is a collector of custom duties stationed here.

The Chicago light-house, as it now stands, bears south 81° 20' west, distant one thousand and twenty-nine (1,029) yards from the extremity of the United States north pier.

The city has grown up to such an extent in its vicinity, as to cause its buildings and other improvements to eclipse this light from the view of vessels on the lake throughout 81 degrees out of the 177 degrees of the horizon that should be illuminated. It has, consequently, been determined to erect a new light-house at or near the extremity of the north pier. The subject having been committed to my attention by the bureau (under whose direction it then was) soon after I took my station here, it was fully reported upon in my report No. 30 of July 30, 1854. A copy of that report is hereto attached, marked A 32.*

* Duplicates of drawings for the engraver, illustrating that report, marked G 5 to G 9 inclusive, are also herewith forwarded.
J. D. G.

Subsequently the subject was placed under the supervision of the light-house board, under which my direction of it is continued.

The foregoing statistics of the commerce of Chicago for the year 1855, and the revenue derived therefrom to the public treasury, will serve to show how important it is to the maintenance of the revenue which should continue to be collected at this port in future years, that the harbor should be preserved in the best condition to insure easy and safe ingress and egress for shipping throughout every navigable season. This will be secured in a permanent manner, so far as relates to the harbor piers, by rebuilding them in solid stone masonry from one foot below to five feet above the lake surface, in the manner herein above proposed. They will not then require scarcely any annual expenditure to keep them in repair.

The statistics have been obtained by much labor and perseverance with a view to the strictest accuracy. It has been a task unavoidably requiring much more time than I had anticipated in the beginning. The result has amply justified the labor; at least, I trust it will be so admitted, for the published statistics of this commerce, which has gone forth to the country through the newspaper press of this city, falls far short of its actual extent. On discovering this fact, I felt it to be a matter of duty to obtain the information directly from the only authentic sources, namely: the custom-house, mercantile and warehouse records. For this object alone, two hundred and twenty-five large folio manuscript counting-house books, numbering in all seventy-eight thousand seven hundred and fifty (78,750) large folio pages, have been examined and thoroughly analyzed, and not a quantity has been used in obtaining our aggregate results which has not been thus derived. If a more critical scrutiny were made into the above mentioned sources of information than we have in some cases of minute details been able to make, it would somewhat augment our results. It could not, in any case, diminish them. In this great labor I have had the valuable assistance of Captain Edward Kelly, of the mercantile marine of this port, whose experience in the shipping business has given him great facilities in seeking proper and reliable sources of information.

I have not taken time to obtain the statistics, in detail, of the amount and value of the manufactures of Chicago for the year 1855; but from a general estimate, founded on reliable data, the value of these for that year has undoubtedly exceeded ten millions of dollars, say \$10,000,000.

The population of Chicago was, on the 31st of December, 1855, about the number of 82,750 souls.

This number is derived from a pretty close estimate made for each ward.

The population has increased, in the several periods below indicated, since the year 1840, as follows, viz:

The population in the year 1840 was.....	4,470
“ “ 1843.....	7,580
“ “ 1845.....	12,088
“ “ 1846.....	14,170
“ “ 1847.....	16,860

The population in the year 1848 was.....	20,035
“ “ 1849.....	23,047
“ “ 1850.....	28,269
“ “ 1852.....	38,733
“ “ 1853.....	60,652
“ “ 1854, December 31.....	74,500
“ “ 1855, December 31.....	82,750

The population of this city is increasing, perhaps in as rapid a ratio as that of any other city in the world; and it will probably go on at about the same rate until it reaches several hundred thousand. The immense agricultural resources of the vast extent of country, the one-fourth part of which is not yet developed, lying to the south, southwest, west, and northwest, which is and must continue to be tributary to the commerce of Chicago through her numerous radiating railroads, together with what is derived by lake navigation, must insure this rapid increase of population, and a corresponding increase of her commerce. They all depend for their prosperity greatly upon the preservation of her harbor, in a good and permanent condition for the ready entrance and safe anchorage of vessels drawing full twelve (12) feet of water.

Such are the claims, which, in a civil point of view, are presented to our mind in behalf of the preservation of this harbor.

There is still another, of not less magnitude, which is exclusively national. It is the influence it would have in the *military defence of this part of our frontier, and the success of our arms, in time of war.*

A single glance at the general map of the United States will be sufficient to show the importance of Chicago as a military position in conducting our operations in defence of our northwestern frontier in time of war. The great depth to which Lake Michigan here penetrates into a populous and fertile country, totally devoid of fortifications, would constitute an irresistible inducement to an enemy, in the event of a national war, to aim, with all his strength, at this point, should he find it divested of any of the chief means of defence which are, by all nations, accorded to maritime ports of chief importance. He would find Chicago very much in such a state of weakness if the harbor works here are allowed to fall into a dilapidated condition; for then our naval force would not itself be secure in hovering about this port, or in cruising in its immediate vicinity for purposes of military defence. There is scarcely a week in the year that a fleet might not have occasion to take refuge from the lake gales to a safe harbor, affording a ready entrance by means of a ship channel of at least twelve (12) feet draught of water. Deprived of this advantage, the only resort would be to take the open sea, and there buffet out the storms. On their subsiding, this defensive fleet, on attempting to resume its proper position, might find it occupied by an enemy with all the advantages, in a combat, which ought to be secured to our side.

An enemy, once possessing the harbor, could, by a powerful fleet, cover the landing of an army in pursuit of the conquest of territory, or designing to lay heavy pecuniary contributions upon the inhabitants. Peace is the proper time to prepare against such a catas-

trophe; and the protection of the harbor in the manner recommended is the first element in the military defence that should be attended to.

With the harbor secured permanently in good condition, the port of Chicago, through the enterprise of the people of Illinois and the surrounding States, will possess the elements of military strength in perhaps a greater degree than any other seaport in the Union. There are as many as ten principal railroads which, at this day, concentrate at this port, after having traversed and intersected an area of most fertile country of 163,240 square miles, or 104,473,600 acres. These railroads have a total length of 2,188 miles, exclusive of branches, which vary in length from 20 to 100 miles and upwards, and make an aggregate length of about 2,720 miles of railroad, which is actually tributary to this port.

This immense reticulation of railroads, traversing or approaching to within a few miles of every homestead, now daily brings into Chicago, for exportation, the vast amount of agricultural produce exhibited in our tables. These are their peace-offerings to other nations. In the emergency of war, however, these railroads could, in a single day, concentrate at Chicago troops enough for any military campaign, even if designed to cover our whole northwestern lake frontier. Besides this, they would be the means of bringing here, daily, the munitions of war, and above all, the necessary articles of subsistence and forage to sustain an army of any magnitude, and to keep it in activity throughout any period that the war might last.

In other words, Chicago would, in time of war, be the chief *point d'appui* of military operations in the northwest. From hence would be sent military supplies of all kinds, spreading, by means of our lake navigation, in every required direction, provided the evident requirements in aid of that navigation are secured now, while we are in full possession of those ample resources which peace alone bestows on a nation, and enables her, without oppressive taxation, to meet the expenses which are necessary to insure success in war, if unfortunately, it should come.

These requirements consist, emphatically, in keeping the harbor of Chicago in an efficient condition for the accommodation of armed vessels of the largest class, that would operate on the lakes in time of war, and in opening and securing an ample channel for the same class of vessels through the St. Clair flats, in Lake St. Clair.

The importance of this last mentioned improvement, both in a civil and a military point of view, will be treated of hereafter, when we come to consider that particular improvement.

A 1.

DOCUMENTS RELATING TO CHICAGO HARBOR.

Special order of the War Department assigning Lieutenant Colonel J. D. Graham to the direction of the harbor works of Lake Michigan.

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,

[Special orders, No. 49.]

Washington, April 7, 1854.

Brevet Lieutenant Colonel James D. Graham, major corps of topographical engineers, is assigned to the charge of the harbor works on Lake Michigan, and will report for further instructions to the chief of his corps.

By order of the Secretary of War,

S. COOPER,
Adjutant General.

A 2.

Topographical Engineer orders, to Lieutenant Colonel Graham.

BUREAU TOPOGRAPHICAL ENGINEERS.

Washington, April 10, 1854.

SIR: You will repair, as soon as practicable, to Chicago, Illinois, in order to take charge of the harbor works on Lake Michigan. The enclosed copy of a letter to Captain Webster is sent for your information.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Lieut. Col. J. D. GRAHAM,

Corps Topographical Engineers, Washington.

APPENDED TO A 2.

Colonel Abert to Captain Webster.

BUREAU TOPOGRAPHICAL ENGINEERS,

Washington, April 10, 1854.

SIR: Lieutenant Colonel James D. Graham has been ordered to relieve you in your duties on Lake Michigan. You will therefore turn over to him all the public property in your possession—the office, office furniture, and all official records and correspondence.

Lieutenant Colonel Graham will probably be at Chicago by the 20th of this month.

In the meantime you are desired, specially, to report to this office the course you have pursued in the adjustment of matters under the

Sweet, Ives, and Hawley contracts, and in reference to the steam dredge boat, under the Howard contract.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Capt. J. D. WEBSTER, *Chicago, Illinois.*

A 3.

Colonel Abert to the harbor agents on Lake Michigan.

CIRCULAR.

BUREAU TOPOGRAPHICAL ENGINEERS,

Washington, April 14, 1854.

SIR: Lieutenant Colonel James D. Graham, corps topographical engineers, has been assigned to the direction of all harbor duties on Lake Michigan, in the place of Captain J. D. Webster, who has resigned. Lieutenant Colonel Graham will be received and respected accordingly.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Addressed to—

John R. Bowes, esq., United States agent, Michigan city, Indiana.

D. Newland, esq., United States agent, Sheboygan, Wisconsin.

Wm. Gamble, esq., United States agent, Waukegan, Illinois.

Samuel Hale, esq., United States agent, Kenosha, Wisconsin.

J. A. Carswell, esq., United States agent, Racine, Wisconsin.

H. W. Gunnison, esq., United States agent, Milwaukee, Wisconsin.

Temple Clark, esq., United States agent, Manitowoc, Wisconsin.

A 4.

Lieutenant Colonel Graham to Colonel Abert, Chief Topographical Engineers.

[No. 1.]

CHICAGO, ILLINOIS, *April 20, 1854.*

SIR: I have the honor to report to you my arrival here, in compliance with the orders of the War Department of the 7th instant, and your subsequent instructions of the 10th instant.

I shall further report to you so soon as the turning over of the public property to me, by Captain Webster, can be accomplished, and the necessary invoices and receipts be interchanged.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Major Topographical Engineers, Br't Lt. Col.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

A 5.

NOTICE TO MARINERS.

OFFICE GENERAL SUPERINTENDENCE OF
LAKE MICHIGAN WORKS,
Chicago, August 15, 1854.

The dredging of the bar off the entrance to Chicago harbor having been completed, notice is hereby given that there is now a clear channel of not less than eleven feet water over the bar between a line drawn northnortheast from the north pier-head, and a line drawn east three quarters south from the end of the south pier. This gives a space of 810 feet, or 270 yards wide, over the bar, of not less than eleven feet water. For a space 200 feet south of the north pier-head there is not less than two fathoms water over the bar.

Rules for entering the harbor :

1. Vessels bound in from the northward and eastward should bring the north pier-head to bear from southsouthwest to southwest, and in doubling the north pier-head give it a berth of 50 to 100 feet, taking care not to strike it. If they do not fall more than 200 feet to the south of this pier-head they will carry twelve feet water clear over the bar. Should they not fall more than 600 feet (200 yards) south of this pier-head they will still carry eleven feet water clear over the bar. Vessels, however, coming in from the northward and eastward had better clear the north pier-head by a berth of 50 to 100 feet, because this will give an ample berth for lee-way with the wind from the north or northeast.

2. Vessels bound in from the southward should, in case the wind is from the south or southeast, bring the extremity of the south pier to bear due west by compass. They can then run in with eleven feet water clear over the bar, and still have a berth 150 feet (50 yards) wide on the larboard side with the same depth of water.

3. Vessels coming in from the east, when broad off the harbor, can run in on a due west course by compass and carry eleven and a half feet water clear over the bar.

When the bar is passed, there are from seventeen to twenty-two feet of water inside, and up the Chicago river to the wharves or usual anchoring places.

4. The rule for vessels entering at night, when the piers cannot be seen, is, to bring the light-house (not the beacon-light on the north pier) to bear from west half south to west three-fourths south by compass, and run in on that course till within the mouth of the river. They will thus carry from eleven to twelve feet water clear over the bar.

Captains and owners of vessels are requested not to deposit any freight or loading on the piers, as it is contrary to the rules necessary for their preservation.

J. D. GRAHAM,
*Lieutenant Colonel, Superintending Engineer of
Lake Michigan Works.*

A 6.

A statement showing the number of cubic yards excavated and removed from the bar at the entrance of Chicago harbor and deposited to leeward, in four and a half to five fathoms water, in Lake Michigan, and exhibiting the effect of each day's work, between May 18 and July 22, 1854.

Date.		Number of cubic yards excavated and deposited in 4½ to 5 fathoms water in Lake Michigan.	Date.		Number of cubic yards excavated and deposited in 4½ to 5 fathoms water in Lake Michigan.
1854.			1854.		
May	18	320	June	†17	
	19	340		*18	
	20	400		19	560
	*21			†20	
	22	420		†21	
	23	480		22	560
	24	480		23	480
	25	420		†24	
	26	440		*25	
	27	560		26	500
	*28		July	5	280
	29	580		6	560
	30	480		7	540
	31	500		8	500
June	†1			*9	
	2	560		10	600
	3	400		†11	
	*4			†12	
	5	660		†13	
	6	400		14	640
	†7			15	300
	†8			*16	
	†9			†17	
	10	660		18	540
	*11			19	560
	12	640		20	440
	13	540		†21	
	14	840		22	180
	15	640			
	†16		Total in 36 working days--		18,000

Dates marked thus (*) are Sundays.

Dates marked thus (†) no dredging could be done, owing to the unfavorable weather or too heavy a sea on the bar.

A true copy of the original statement.

J. D. GRAHAM,

Major Tbp. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

A 7.

Notice to masters of vessels, and all others, forbidden trespass on the United States harbor piers.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, August 15, 1854.

The piers for the protection of Chicago harbor having been much injured by depositing upon them lumber, wood, stone, iron, and other articles—

NOTICE is hereby given that it is contrary to the government rules to do so.

All persons are therefore prohibited from doing the like in future.

All persons possessing property of any description piled upon the harbor piers will please cause it to be removed therefrom without delay.

In cases where it may be absolutely necessary to cross the piers with materials in order to reach points where they are actually to be used in building, &c., proper and reasonable facilities will, upon special application at this office, be granted for so doing by passing them over in parcels by hand in the case of lumber or timber, and in wheelbarrows or light hand-carts running upon plank ways in the case of stone, iron, and other heavy materials; the articles in all cases to be crossed clear over, and not deposited upon the piers.

It is made the duty of the inspector of the piers and watchman of the public property to visit them daily to see that the rule is observed by all concerned.

J. D. GRAHAM,
Lieut. Col., Superintending Engineer, &c., &c., &c.

Instructions to the public watchman to prevent trespass on the United States harbor piers.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, August 15, 1855.

SIR: You will visit and inspect daily the public piers created for the preservation of Chicago harbor, both on the north and south sides of the river, and see that no materials of any kind whatever are deposited or piled upon them. All infractions of this rule will be reported, together with the names of the offenders, to this office. In like manner all damage to the piers or other public property will be promptly reported. You will please cause the printed NOTICE to be put up in conspicuous places, and also serve them upon all persons who may stand in need of information on the subject.

J. D. GRAHAM,
Superintending Engineer, &c.

A. B. DALTON,
Watchman of the U. S. property, Chicago, Ill.

A 8.

*The Board of Trade of Chicago to Colonel Graham.*BOARD OF TRADE ROOMS,
Chicago, July 26, 1855.

DEAR SIR: In compliance with a resolution passed at a meeting of the Board of Trade this morning, I am directed to ask of you permission to use the government dredge for the purpose of dredging the north channel of our harbor, and to do such other work as may be necessary to perfect the entrance into the harbor with safety.

I remain, very respectfully, your obedient servant,

HIRAM WHEELER,
President of the Board of Trade.

Colonel J. D. GRAHAM,
Superintending Engineer of government works,
Chicago, Ill.

A 9.

*Colonel Graham to the Board of Trade of Chicago.*OFFICE OF GENERAL SUPERINTENDENCE, &c.,
Chicago, July 27, 1855.

SIR: I have the honor to acknowledge the receipt of your communication of yesterday, in regard to dredging out the north channel of Chicago harbor by the use of the United States dredge-boat now under my direction.

In reply, I have to state, for the information of your board, that in every similar case the government has required that the management of the dredge-boat and the whole operation of dredging should be under the direction of this office and conformable with the approved plan of the War Department. Funds raised by corporations or by private subscription for such objects can be appropriated, under the direction of the United States superintending engineer, to such object, without any other expense to such corporation or private subscription than may be required to pay the steam engineer and working crew, and incidental expenses of running the engine and keeping everything in working order during the operation. The crew to be paid every Saturday evening, at this office, upon the certified time and pay-rolls, by an agent appointed for that purpose by the said corporation or private subscription party, to whom the said agent must render his accounts and be accountable for the funds placed in his hands.

Under the foregoing rules the United States dredge-boat can be employed in dredging out the north channel here so soon as she shall have finished her previous engagements, her present directing steam engineer and crew to be retained as long as they continue efficient.

I estimate that an expenditure of \$250 per week, for 6 weeks' work, or a total of \$1,500, will be sufficient to dredge the desired channel so as to give a depth of 11 to 12 feet for a width of at least 300 feet over the bar.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieut. Col., Sup'g Eng., &c.

HIRAM WHEELER, Esq.,
President of the Board of Trade, Chicago.

A 10.

Colonel Graham to Assistant Millar, at Kenosha.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, September 20, 1855.

SIR: On my return here this afternoon from Waukegan, whither I was obliged to go to see to the care of the public property there during the late severe storm, I received your letter in relation to the pile-hammer. It, together with the scoop-bucket, must be retained on board the United States steam-dredge until they and the pile-driver shall arrive here. You and Mr. Myers will please have all the United States scows (five in number) ready to be towed here at a moment's warning. The city authorities of Chicago will engage a steamer to tow them here immediately, so that we may go to work at once to dredge a channel through the bar near the north pier. The United States dredge will come along in company with them, and also the horse-dredge and pile-driver, if ready, which I hope is the case. No offer having been made for it elsewhere, it must come here.

I am, very respectfully, &c.,

J. D. GRAHAM,
Lieut. Col., Sup'g Eng., &c., &c.

Mr. ROBERT M. MILLAR,
Assistant, now at Kenosha, Wisconsin.

A 11.

From Charles P. Magill, general western agent of the Collingwood line of steamers, &c., to Colonel Graham.

OFFICE OF THE ONTARIO, SIMCOE, AND HURON RAILWAY LINE,
Chicago, September 25, 1855.

DEAR SIR: The Collingwood steamers will tow your scows from Kenosha to this place, free of charge, if they are ready and the weather favorable. The Keystone State is the only boat now due. She will be at Kenosha about Thursday morning next, I think. The other

boats are here now. The captain of the Keystone State is coming through in a hurry, as he is anxious to leave here on his regular time; but I will write him at Milwaukie, requesting him, if possible, to tow some of the scows up, if he cannot tow all.

With much respect, I am, yours, &c.,

CHARLES P. MAGILL,
General Western Agent.

Colonel J. D. GRAHAM,
Superintending Engineer, &c.

A 12.

Colonel Graham to Mr. R. M. Millar.

[By telegraph.]

CHICAGO, *September 26, 1855.*

SIR: The steamer Keystone State will call at Kenosha to-morrow, and take our scows in tow to this place. Be ready with them early to-morrow morning, the 27th, so as not to detain the steamer.

J. D. GRAHAM,
Lieutenant Colonel, &c.

Mr. ROBERT M. MILLAR,
Assistant, &c., now at Kenosha, Wisconsin.

A 13.

Colonel Graham to the Board of Trade of Chicago.

OFFICE OF GENERAL SUPERINTENDENCE, &c.,
Chicago, October 10, 1855.

GENTLEMEN: I have been waiting, now more than two weeks, for your body to employ a steam vessel to tow from Kenosha to this place the United States scows belonging to the steam dredge, so that I may go to work to dredge a ship channel through the bar which obstructs the direct and best entrance that should be preserved to your harbor.

Attempts to induce steamers, employed in trade, to take up these scows on their regular trips having failed, I would recommend to your body that a proper steam-tug be specially employed for that purpose, without further delay.

The weather promises to be favorable for dredging for some weeks to come, and I indulge the hope of being able, during its continuance, to give you a practicable channel through the bar, if the scows can be immediately brought here.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieutenant Colonel, &c.

To the PRESIDENT and MEMBERS of the Board of Trade, Chicago.

A 14.

The Board of Trade of Chicago to Colonel Graham.

CHICAGO, October 10, 1855.

DEAR SIR: Your communication of this date, addressed to the president and members of the Board of Trade of Chicago, was duly received and presented for their consideration, at their meeting on 'change this forenoon.

After some deliberation it was resolved by the board, in view of the lateness of the season, with the probability of the work being much interrupted by the unsettled weather, to defer, until early in the ensuing spring, the dredging named in your communication, and the undersigned was requested to represent to you this action as the will of the board.

Very respectfully, your obedient servant,

S. B. POMEROY,
Vice President.

Colonel J. D. GRAHAM,
Superintending Engineer, &c., &c.

A 15.

Colonel Graham's report on the proposed opening in the United States south pier at Chicago, for an outlet from the ship basin of the Illinois Central Railroad Company.

[No. 34.]

OFFICE GENERAL SUPERINTENDENCE OF

LAKE MICHIGAN WORKS,

Chicago, September 4, 1854.

SIR: Your communication of July 8, enclosing the application of J. F. Joy, esq., on behalf of the Illinois Central Railroad Company to the honorable the Secretary of War, to be allowed to make an opening in the south government pier at this harbor, in order to admit the passage of vessels between the Chicago river and the said company's basin, was duly received, together with a map showing the position of this basin and of the company's grounds and buildings adjacent to it. Your instructions require me to report upon this application of the company without delay. Soon after receiving them I had an interview with Mr. Joy, the company's solicitor, and Mr. Mason, (the company's chief engineer,) upon the subject, and found that the proposition involved some important hydraulic principles, requiring me to give them patient examination before I could report satisfactorily upon it. To gain a knowledge of these has required observations of the force and direction of the river current and of the specific gravity of the silt wafted down by that current, throughout

all the time that has elapsed since I received your instructions on this subject.

I find, on examination, that the map forwarded by Mr. Joy, although it shows the company's basin, grounds, and buildings with sufficient accuracy for ordinary purposes, is not critically correct in the delineation of the piers and the contour of the river above them. I take leave, therefore, to refer, in illustration of my remarks, to the accompanying map, (marked G No. 12,* projected from surveys made in 1854, under my direction, on a scale of $\frac{1}{2400}$ or 200 feet to 1 inch.)

The descending current of the river which, during the spring freshets, is deflected from the concave portion of the north shore, between C and D, and in its new course between the piers, impinges about equally on both piers, until it reaches the angle in the south pier at *x*, (see map.)

Here there is a very slight check, where it was necessary to make a cautious examination to ascertain if there was any considerable deposit of silt, because it is just here that the railroad company wish the privilege of making the opening in the south pier, and if the deposit were appreciable now, it would no doubt be augmented after the opening, for the reason that the point of resistance would then be at S, the extremity of the east wall of the company's basin, and the line of resistance would form an angle of about 77° with the direction of the current. If the silt consisted of granitic or silicious sand, or any other matter of great specific gravity, a check of the current by a force acting so nearly at right angles to it would, undoubtedly, cause an immediate precipitation to the bottom, and thus form sand-bars. I have taken pains to examine the character of this silt, brought down by the river current. It is somewhat different from that which is brought down by the lake-shore current, and which forms the outer bar off the entrance to the harbor.

It consists chiefly of a vegetable alluvium of but little specific gravity, not so quickly precipitated as that composed of silicious matter, such as we find composing the sand spits and bars on the Atlantic sea coast. It is held in suspension longer when wafted along by a current of any given velocity. It is not so quickly precipitated by an opposing body checking, suddenly, the velocity of the current, because its specific gravity is so nearly equal to that of water.

This theory seems to be fully confirmed by the soundings at and near this particular part of the river, recently made and laid down on the accompanying map, marked G No. 12, a duplicate of which was lately transmitted to you, for the purpose of illustrating the condition of the harbor, as referred to in my report (No. 32) of the 19th ultimo. It will there be seen that the depth of water at opposite points alongside of the north and south piers is almost exactly the same from a point commencing 150 feet above the proposed opening, and continuing thence 940 feet east, or as far east as the parallelism of the piers is preserved. In other words, we see that the deposite along the shores,

* The references are here transferred from map G No. 4 (where they were made in my original report) to map G No. 12, the indications alluded to being the same on both maps, and the printing of one will suffice.

formed by the two piers, is the same on the one side that it is at opposite points on the other. There seems to be no tendency whatever to the formation of a bar at the re-entering angle of the south pier where the opening is desired. If the opening were made, the *régime* of the deposite would be so slightly changed, from the fact that the company's basin is to be closed throughout, except at the opening at x , that I do not think any bar would be formed which could, in the least, injure the navigation of the river. If a bar were formed at all, it would be very slight, and would be confined entirely within the company's basin, upon the north extremity of their east wall, a little south of the point S. Even this would not affect in any way the navigation of the river, and the evident interest of the company would be to keep it down by dredging. If allowed to exist it would prove a nuisance to no one but themselves.

I would therefore respectfully recommend, for consideration, that the privilege to make the opening, not exceeding 130 feet in width, be granted on the following conditions, to be duly stipulated in writing, namely :

1. That before any proceeding towards a breach in the south pier is commenced, the company shall have closed the walls or crib work of their basin on all sides in such manner as to render them sufficiently water tight to prevent any current between the said basin and Lake Michigan ; and also so as to prevent any current, and any water communication between the said basin and any other basin which may have an open communication with the said lake.

2. That there shall never be made any other opening or water communication between the said basin and Chicago river than that now granted through the south pier of the said river, at the point marked x on the map marked G No. 12, hereto attached, without the consent, previously obtained, of the War Department of the United State.

3. That a good and sufficient communication along the south pier shall be constructed across the said opening by means of a drawbridge moving on iron wheels or rollers running on an iron railway, whose direction shall be in the prolongation, to the west, of the present line of the south pier, drawn from its present eastern terminus directly to the point x marked on the aforesaid map G No. 12, hereto attached.

4. That there shall be constructed at each extremity of the aforesaid opening in the south pier a good and sufficient abutment pier for the support of the aforesaid drawbridge, and that these two abutment piers shall be of masonry, resting, at a depth of two feet below the level of the surface of the water at its lowest ascertained stage at the point in question, upon piles, the whole to be in accordance with such dimensions, plan and specifications as shall be approved by the Topographical Bureau and sanctioned by the War Department of the United States.

5. That the aforesaid opening in the south pier shall not be commenced until such time as shall be previously recommended by the Topographical Bureau and approved by the War Department of the United States.

6. That the expenses of making the aforesaid opening and drawbridge, and the two abutment piers, and all appurtenances, shall be

borne by the Illinois Central Railroad Company and their successors and assigns, and shall be carried on under the direction and supervision of such engineer or engineers as shall be designated by the War Department of the United States, whose duty it shall be to adhere and conform to the dimensions, plan, and specifications aforesaid.

7. That all repairs and renewals of any part or the whole of the aforesaid work shall always, and at all times be at the expense of the Illinois Central Railroad Company, and their successors and assigns, and in accordance with such plan and specifications as shall be approved by the War Department of the United States.

8. That the jurisdiction over, and control of, the aforesaid draw-bridge and abutment piers, and all their appurtenances, shall always be vested in the United States, in as full a manner as the piers constructed at the expense of the said States, and that they shall always be subject to such rules and regulations, in regard to the manner and time of opening and closing the same, as shall from time to time be specified, required, and directed by the War Department of the United States.

I have taken leave to make the foregoing suggestions for consideration, because, after due reflection, they appear to me to embrace points that ought not to escape attention, and are necessary to be fully understood, in order to prevent collision hereafter between the government and the railroad company. They are merely submitted for such consideration as the proper authority may conceive to be due to them.

Before closing this communication, I beg leave respectfully to submit for consideration a diagram I have marked out on the map G No. 12, in red dotted lines, for the limits of excavation, under the act of Congress of July 21, 1852, to be done by the corporate authorities of the city of Chicago, for the improvement of the navigation of the Chicago river. The corporate authorities of the city are quite sensible that it would never answer to make the excavation as wide as the utmost limit specified in the act,* nor in deed to make its limit conform throughout with any straight line whatever. I have been requested by several members of the city council to communicate to that body my views upon this subject for their consideration, but I have scarcely felt authorized to do so, without first submitting them to you, awaiting your approbation or decision. The object of the excavation, as you are aware, is to widen the river sufficiently to give the necessary sea room to vessels to enable them to double more easily the abrupt bend which extends from a point within the vista of Michigan avenue to some distance both above and below that point. Were the excavation made up to the southern limit of the conditional grant embraced

* When this report was written, I supposed that the straight line represented on Mr. Secretary Conrad's map, which was appended to his deed of sale to the Illinois Central Railroad Company of the 14th of October, 1852, as the true limit of excavation, under the act of July 21, 1852, was correct. A copy of that deed is hereto attached, marked A 27. The map which accompanied it is herewith submitted, marked No. 25, in which this line appears. Afterwards, however, when the duty of officially marking the line of excavation was committed to me by the Hon. Jefferson Davis, Secretary of War, in conformity with the law, I discovered that Mr. Conrad's line was not the line authorized by the law, and the whole matter had to be settled on different principles, as will appear by the accompanying documents marked A 21 to A 26, inclusive, and doc. D, attached to A 26, and the accompanying map marked G No. 17 — J. D. G.

in the act, it would undoubtedly injure the navigation, because it would render the river so much wider there than anywhere else, that the much slackened current would continually deposit the silt all over this over-widened portion, and very soon render the water so shallow as to obstruct the passage of even the smaller class of vessels. An additional objection to extending the excavation as far south as the straight line limited by the act is, that it would render the turn in the river at the western extremity of that line more abrupt and more difficult for vessels than it is at present.

In consideration of these circumstances, I would recommend that the following plan be adopted for the improvement of the navigation of the river at this bend, viz :

1. That the excavation be commenced below, at the point marked E, (map G, No. 12,) and that its limit, south of the present shore, be a straight line for a distance of 510 feet on the prolongation of the interior or water face of the present eastern section of the south pier, reaching to the point B. From thence the limit of excavation to be the periphery of an arc of $50^{\circ} 25'$ of a circle described on a radius of 605 feet and tangent to the aforesaid straight line; the said arc terminating at the point A, at a tangent to the prolongation of the southern shore of the river, northeastwardly from the point z. From the termination of the said arc at A, the limit of excavation to be along the said tangent straight line till it reaches the river shore at z, a distance of 155 feet, or thereabout, more or less.

2. That when the excavation shall be completed up to the limits above described, the shore of the river be protected from the abrasion of the current by a good and sufficient pier-work, fourteen feet wide, at least.

3. That the width of the river be then reduced to 200 feet uniformly by pier-work, at least fourteen feet wide, from the first point of deflection in the course of the north pier at G, thence about 665 feet along the straight line G H, parallel to the straight line E B, or until it meets its tangent circular arc H I, described by a radius of 805 feet from the same centre with the circular arc A B; thence along the periphery of the circular arc H I, parallel with the arc A B, until it meets its tangent straight line I K, parallel to the straight line A z; thence along the said line till it joins the north shore opposite to the point z.

4. That the space between this new pier on the north side and the present north shore be filled with clay or earth conveniently procured.

5. That the river between these two newly made shores be dredged out to the depth of at least fourteen feet.

This plan of improvement would reduce the width of the newly made portion of the river to that between the present piers where they are parallel; and it would, I think, make the turn in the bend of the river easy and practicable for all vessels. Unless some well digested plan be adopted to govern the improvement of the navigation, as contemplated in the act of July 21, 1852, it is much to be feared that the navigation may be seriously injured.

I will remark that the Illinois Central Railroad Company's slip or basin was laid down upon the original map, marked G No. 4, now in

the Topographical Bureau, according to the original plan of the company. This plan, Mr. Mason informs me, has since been somewhat modified, as shown on the accompanying duplicate of that map, in red.* The full lines show the portion of the walls of the basin that are completed.

The dotted lines indicate the portions that are in progress of construction, but which are yet incomplete.

The letter of Mr. Joy to the honorable the Secretary of War, of May 5, and the map, which, along with it, accompanied your directions of July 8, are herewith returned.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj. Corps Top'l Eng's, Brev. Lieut. Col., Sup'g Engineer.

Endorsement of the Secretary of War on the above report:

"The application for permission to make an opening in the south pier is approved, with the limitations and reservations recommended by Lieutenant Colonel Graham.

"JEFF'N DAVIS,

"Secretary of War.

"WAR DEPARTMENT, *September 25, 1854.*"

The President of the Board of Engineers to Colonel Abert.

OFFICE BOARD OF ENGINEERS,

LAKE HARBORS AND WESTERN RIVERS,

Washington, September 13, 1854.

SIR: I am instructed by the board to make the following report upon the letter of Brevet Lieutenant Colonel J. D. Graham of the 4th instant.

Colonel Graham's letter treats:

1st. Of the question of an opening in the south government pier at Chicago, in order to admit the passage of vessels between the river and the Illinois Central Railroad Company's basin at that place; and,

2d. Respecting the improvement of the navigation of Chicago river by the corporate authorities of the city of Chicago, under the act of Congress of July 21, 1852.

The board fully approves the views, recommendations, and sugges-

*This contemplated modification was not, after all, adopted. The basin has been built as at first shown on the original map G No. 4.

DECEMBER 31, 1855.

J. D. G.

tions of Colonel Graham respecting these subjects, and would very respectfully recommend them to be carried into effect.

Very respectfully, I have the honor to be, sir, your obedient servant,

JAMES KEARNEY,
Lieut. Col. Top. Eng'rs, Pres't of Board.

Col. J. J. ABERT,
Bureau of Topographical Engineers.

P. S.—Colonel Graham's letter of the 4th instant, and his map G No. 4, are herewith returned.

J. K.

Col. Abert to the Hon. the Secretary of War.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, September 14, 1854.

SIR: Application was made some time since by the Illinois Central Railroad Company to open a passage through the United States pier, between the basin of the company and the river.

In order to obtain the most desirable information on the subject, the matter was referred for report to Brevet Lieutenant Colonel Graham, and his report, when received, was referred to the board of engineers on lake harbors and western rivers. Both reports are now submitted to the decision and direction of the honorable the Secretary of War.

Brevet Lieutenant Colonel Graham, in his report, also indicates an excavation line for the city under the law of July 21, 1852. Upon this line the board of engineers also reports. The board "fully approves of the views of Colonel Graham respecting these subjects," and "recommends them to be carried into effect."

The law of July 21, 1852, gives authority to the city to excavate "according to the plan set forth in said memorial," but the law also empowers the Secretary of War "to cause the limits above designated to be marked out."

As the line of excavation marked out by Brevet Lieutenant Colonel Graham does not coincide with the plan (of the city) as set forth in said memorial,* upon which the law of July 21, 1852, was predicated, it appears to me as essential to the question that the city of Chicago should, by some formal act, accept or acquiesce in the line of excavation as recommended by Brevet Lieutenant Colonel Graham, and by the board.

In conformity with this explanation, it is respectfully recommended that the opening into the basin, as recommended by Brevet Lieutenant Colonel Graham, in locality, in restrictions, and in mode of operation, be approved; also, that the line of excavation be approved, if

* It will be seen by reference to map G No. 26, herewith presented, and to documents A 22 to A 26, inclusive, that the line, as described in the memorial above referred to, was entirely indefinite, and could not be marked out under said description of it.

J. D. G.

said line should also be approved, accepted, and acquiesced in by the city of Chicago.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,

Secretary of War.

Endorsement on the above letter.

“The application for permission to make an opening in the south pier is approved, with the limitations and reservations recommended by Lieutenant Colonel Graham.

“JEFF’N DAVIS,

Secretary of War.

“WAR DEPARTMENT, *September 25, 1854.*”

A 16.

Bond of the Illinois Central Railroad Company, and conditions in reference to the opening in the United States south pier at Chicago for said company's benefit—1855.

Know all men by these presents, that the Illinois Central Railroad Company doth hereby acknowledge itself to owe and to be indebted unto the United States of America in the penal sum of two hundred thousand dollars, lawful money of the said United States; for the payment of which said sum, well and truly to be made, it doth hereby bind itself, its successors, and assigns, solemnly and firmly by these presents.

In witness whereof, the said company have caused this bond to be signed by its president and treasurer, and its corporate seal to [L. s.] be thereunto affixed at their office, in the city of Chicago, this 20th day of April, in the year of our Lord 1855.

Now, the condition of the above obligation is such, that whereas the said United States of America hath, upon the application of the said company, consented to allow the said company to make an opening in the United States south pier of the harbor of Chicago, to communicate with the said company's proposed ship basin adjoining their depot grounds at Chicago; in consideration of which said consent, the said company hath agreed, and doth by these presents agree, to keep, observe, and perform, certain terms, conditions, stipulations, and agreements, deemed essential by the United States to the future security, safety, and accommodation of the navigation and commerce of

the people of the United states, carried on at the said Chicago, and the future security and permanence of the public works and harbor at Chicago, and embodied and contained in certain articles of consent and agreement bearing even date with these presents, to which reference is hereby made, which said articles are mutually signed and duplicated by the respective parties hereto, through their authorized agents.

Now, therefore, if the said Illinois Central Railroad Company shall, well and truly on its part, keep, observe, perform, and comply with the terms, stipulations, covenants, and conditions, and agreements contained in the said articles, upon its part to be kept and performed, and every part thereof, according to the true spirit and meaning and intent of said articles and the conditions thereof, then, and in that case, the above obligation to be void, otherwise to remain in full force and virtue.

The Illinois Central Railroad Company, by
[L. S.] J. N. A. GRISWOLD, *President*.
J. N. PERKINS, *Treasurer*.

Articles of consent and agreement made and concluded this twentieth day of April, A. D. one thousand eight hundred and fifty-five, by and between the United States of America, acting through the War Department of the United States, of the one part, and the Illinois Central Railroad Company, of the other part:

Witnesseth, that upon the express application of the said Illinois Central Railroad Company for permission to cut an opening from its depot grounds at Chicago through the south pier of the Chicago harbor, for a communication with the said company's proposed ship basin adjoining the said depot, the said United States of America hath consented to grant, and does hereby grant, such permission, upon the express reservations, conditions, and terms hereinafter expressly stated and set forth, to be well and truly kept, complied with, observed, and performed by the said Illinois Central Railroad Company, with this express reservation, however, that upon failure at any time by the said company to so keep, comply with, and observe, and perform the terms and conditions herein contained, and every part thereof to be kept and performed, that the said United States may revoke such consent so, as aforesaid, expressly granted, and that in such case the said Illinois Central Railroad Company shall be at all the expense of closing such opening in the said south pier, and of properly restoring the said pier and harbor in as good and perfect condition to the United States as the same were in before the grant of such permission was made, and that such closing shall be made and carried on under the direction, orders, and supervisions of such engineer or engineers as shall be designated for that purpose by the War Department of the United States.

And whereas, in consideration of such grant of the permission so

given by the United States, as aforesaid, to the said company, it is deemed essential by the United States to the future security and permanence of the harbor and public works at Chicago, and also to the future security, safety, and accommodation of the navigation and commerce of the people of the United States, carried on and to be carried on at Chicago, that the said consent should only be made upon the conditions, terms, stipulations reservations, agreements, and covenants herein expressly agreed to, reserved, and contained on the part of the company.

Now, therefore, the said Illinois Central Railroad Company, in consideration as aforesaid, doth hereby expressly promise, agree, and stipulate, to and with the United States, as follows, to wit:

1st. That before any proceeding towards a breach or opening in the said south pier is commenced, the said company shall have closed the walls or crib-work of their basin on all sides, in such manner as to render them sufficiently water-tight to prevent any current between the said basin and Lake Michigan, and also so as to prevent any current and any water communication between the said basin and any other basin which may have an open communication with the said lake.

2d. That there shall never be made any other opening or water communication between the said basin and Chicago river than that now granted through the said south pier of the said harbor, at the point marked x on the chart marked "sheet G, No. 12," hereto attached, without the express consent, previously obtained, of the War Department of the United States, in writing, upon such further conditions as may be mutually assented to and agreed upon.

3d. That a good and sufficient communication along the said south pier shall be constructed across the said opening therein, by means of a drawbridge moving on iron wheels or rollers and running on an iron railway, whose direction shall be in the prolongation, to the west, of the present direction of the south pier, drawn from its present eastern terminus directly to the angle, at the point x, now existing in the south pier, as marked and shown on the said chart G, No. 12, hereto attached.

4th. That there shall be constructed, at each extremity of the said opening in the south pier, a good and sufficient abutment pier for the support of the said drawbridge, and that these two abutment piers shall be of masonry, resting at a depth of two feet below the level of the surface of the water at its lowest ascertained state at the point in question, upon piles; the said drawbridge and abutment piers to be in accordance with such dimensions, plan and specifications as shall be approved by the Topographical Bureau and sanctioned by the War Department of the United States.

5th. That the aforesaid opening in the south pier shall not progress or be carried on until such time as shall be previously recommended by the Topographical Bureau and approved by the War Department of the United States.

6th. That the expenses of making the aforesaid opening and the drawbridge and the two abutment piers, and all their appurtenances

shall be borne by the said Illinois Central Railroad Company, its successors and assigns, and shall be carried on under the direction, control, and supervision of such engineer or engineers as shall be designated by the War Department of the United States, whose duty it shall be to adhere and conform to the dimensions, plan, and specifications aforesaid.

7th. That all repairs and renewals of any part or the whole of the aforesaid work shall always, and at all times, be at the expense of the said Illinois Central Railroad Company, and their successors and assigns, and in accordance with such plan and specifications as shall be approved by the War Department of the United States.

8th. That the jurisdiction over and the control of the aforesaid drawbridge and abutment piers, and all their appurtenances, shall always be vested in the United States in as full a manner as the piers constructed at the expense of the said States, and that they shall always be subject to such rules and regulations in regard to the manner and time of opening and closing the said drawbridge as shall, from time to time, be specified, required, and directed by the War Department of the United States.

9th. It shall be at the option of the War Department of the United States, whenever it shall deem any of the conditions and stipulations aforesaid violated on the part of the said Illinois Central Railroad Company, to revoke the permission so, as aforesaid, granted, and to cause the aforesaid opening in the south pier to be closed.

10th. That in case of such revocation being made, and notice in writing thereof served upon the agent or agents of the said company at Chicago or New York, the said Illinois Central Railroad Company shall close the said opening and restore said pier and harbor in as good and perfect a condition as the same were in at the time of the granting of the aforesaid permission; and that upon a failure on the part of the said company so to do, the War Department of the United States shall proceed and restore the said pier and harbor, and the said company hereby stipulates and agrees, in such case, to pay all the expenses of such restoration to the United States.

11th. It is hereby further expressly understood that for a more full and perfect explanation of the conditions, covenants, and agreements of these articles, and the references therein made to the chart hereto attached, that the same, entitled "sheet G, No. 12, chart of Chicago harbor, Illinois, showing the main entrance for ships, and the state of the bar after completing the dredging between the 18th of May and the 22d of July, 1854; from survey made in August, 1854, under the superintendence of Brevet Lieutenant Colonel J. D. Graham, major United States topographical engineers, superintending engineer of Lake Michigan works," shall constitute, and be regarded as, an integral part of these articles, to accompany the same, and to which, for greater certainty, reference is hereby expressly made.

In testimony whereof, these articles bearing even date, as above expressed, with a bond hereto prefixed, are signed in duplicate by Jefferson Davis, Secretary of War, on the part of the United States, with the seal of the War Department thereunto affixed at Washington the 27th day of June, 1855, and by J. N. A. Griswold, president,

and J. N. Perkins, treasurer, of the said Illinois Central Railroad Company, with the corporate seal of the said company also thereunto attached, at their office at the city of Chicago, Illinois, the 20th day of April, 1855.

[L. S.]

JEFF'N DAVIS,
Secretary of War.

The Illinois Central Railroad Company, by

[L. S.]

J. N. A. GRISWOLD, *President.*J. N. PERKINS, *Treasurer.*

A 17.

Estimate of funds required for the repairs of the United States piers at Chicago harbor, Illinois, and for the improvement of said harbor for the fiscal year ending June 30, 1857.

1. For the repairs required to be done in stone masonry—	
This includes the first section of the north pier, (from G to L—see map G, No. 22,) a length of	1,510 feet.
The south pier, from its east extremity to the ship basin of the Illinois Central Railroad Company.— (See the same map.).....	908 feet.
Total length to be repaired in stone masonry.....	<u>2,418 feet.</u>

The estimate for 100 feet in length, by 20 feet wide and 6 feet high, as per the horizontal and vertical sections shown in the drawing, marked "sheet G, No. 24," will be as follows:

For 6,200 cubic feet of large stones for stretchers and headers, at 30 cents per cubic foot.....	\$1,860 00
For rough dressing stone, and drilling dowel holes, at 5 cents per cubic foot.....	310 00
For 335 dowel pins, each 6 inches long, of 1½ inch round wrought iron, at 15 cents each.....	50 25
For 60 barrels of hydraulic cement, at \$1 75 per barrel	105 00
For 20 loads of sand, (including hauling,) at 35 cents per load.....	7 00
For wages of masons and laborers in setting stretchers and headers, at 15 cents per cubic foot.....	930 00
For 5,600 cubic feet of rough quarry stone to place be- tween the two face walls, at 5 cents per cubic foot.....	280 00
For 112 barrels hydraulic cement, at \$1 75 per barrel...	196 00
For 56 barrels common lime, at \$1.....	56 00
For 112 loads of sand, and hauling, at 35 cents.....	39 20
For wages of masons and laborers in setting rough quarry stone, at 5 cents per cubic foot.....	280 00
	<u>4,113 45</u>

Brought forward.....	\$4,113 45
Add 10 per cent. for contingencies.....	411 35
For tearing away and removing decayed wood work and boulder stone, at \$2 50 per lineal foot.....	250 00
Estimated expense for 100 feet.....	<u>4,774 80</u>
Then, 2,418 feet of north and south piers, at \$4,774 80 per 100 feet, equal to.....	<u>115,454 66</u>

2. For the repair of the second section of the north pier, with white oak timber—

Length of section, extending from L to M.—(See map G, No. 22,) equal to 377 feet.	
For ten cross-ties of white-oak, each 24 feet long and 1 foot square, equal to 240 cubic feet, at 20 cents per cubic foot.....	\$48 00
For 30 pieces of white oak plank, for flooring, each 24 feet long, and 12 by 3 inches, equal to 2,160 feet, board measure, at \$22 per thousand.....	47 50
For 40 wrought iron bolts, each 30 inches long and 1 inch square, equal to 338 pounds, at 4 cents per pound	13 52
For 180 wrought iron spikes, each 6 inches long, and $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, being 6 to each plank, equal to 36 pounds, at $7\frac{1}{2}$ cents per pound.....	2 70
For superintendence and workmanship.....	50 00
For tearing off and removing decayed or broken timbers, and removing and then putting back boulder stone...	50 00
	<u>211 72</u>
Add 10 per cent. for contingencies.....	21 17
Amount required for the second section.....	<u>232 89</u>

3. For the repair of the third section of the north pier; length of section 144 feet, terminating at the east face of the north pier head:

For 80 piles of white oak, each 50 feet long and 1 foot square, equal to 4,000 cubic feet, at 25 cents for this length.....	\$1,000 00
For 3 sills of white oak, for capping piles, each $26\frac{2}{3}$ feet long and 1 foot square, equal to 80 cubic feet, at 20 cents.....	16 00
For 16 cross-ties (for uniting piling with the faces of the pier head,) of white oak, each 12 feet long and 1 foot square, equal to 192 cubic feet at 20 cents.....	38 40
For 112 wrought iron bolts, each 30 inches long and 1 inch square, equal to 946 $\frac{1}{2}$ pounds, at 4 cents per pound.....	37 86
For workmanship on the above.....	460 00

For repairing ruptured joint at the west shoulder of the north pier head.

For 6 pieces of white oak timber, each 30 feet long and 1 foot square, for the repair of longitudinal walls, equal to 180 cubic feet, at 20 cents.....	\$36 00
For 6 cross-ties of white oak, each 24 feet long and 1 foot square, equal to 144 cubic feet, at 20 cents.....	28 80
For 2 braces of white oak, each 10 feet long, and 2 braces of white oak, each 15 feet long, and 1 foot square, equal to 50 cubic feet, at 20 cents.....	10 00
For 32 bolts of wrought iron, each 30 inches long, of 1 inch square, equal to 270½ pounds, at 4 cents per pound.....	10 80
For workmanship and superintendence.....	120 00
	1,757 86
Add 10 per cent. for contingencies.....	175 78
Amount required for the third section.....	1,933 64

4. For machinery, office rent, fuel for same, stationery, and pay of three assistants to perform the duties of draughtsmen, and of copying official letters, &c., in the office of the superintending engineer, and for commutation for, or supplying in kind, fuel and quarters for the superintending engineer:

For a one-horse power pile-driver, resting on a substantial floating hull.....	\$800 00
For 2 derricks and cranes, for lifting heavy blocks of stone, and appurtenances, at \$300 each.....	600 00
For 2 stone-scows, at \$280 each.....	560 00
For the rent of office for the superintending engineer and his assistants and draughtsmen, one year.....	600 00
For fuel for same, for one year.....	150 00
For commutation for 4 rooms and fuel for superintending engineer for one year: quarters, \$480; fuel, \$250; total for one year.....	730 00
For stationery, drawing paper, &c.....	120 00
For a survey of Chicago harbor, based on a triangulation	350 00
For pay of 3 assistants, in office of superintending engineer, to perform the duties of draughtsmen, surveyors of harbor, copying official letters, making out accounts, &c., at \$960 each.....	2,880 00
For transportation.....	100 00
	6,890 00
Add 10 per cent. for contingencies	689 00
Fourth head—amount required.....	7,579 00

5. For a steam dredge boat for Chicago harbor :

Dimensions.

Length of keel.....	110	feet.
Breadth of beam.....	25	"
Depth of hold.....	$\frac{1}{2}$	"
Length on deck.....	125	"
Greatest breadth on deck.....	40	"

Cost of building and rigging.

Hull, 217 tons at \$35 per ton.....	\$7,595	00
Windlass, capstan, chocks, &c.....	150	00
Carriage frames and wheel houses.....	200	00
Engine room and upper cabin.....	470	00
2 engines and 2 boilers, of forty-horse power each, with cylinders of 12-inch bore and 28 inches stroke.....	3,500	00
26 dredging buckets, (13 on each side,) at \$50 each.....	1,300	00
Bucket chains.....	500	00
Journals and boxes	150	00
2 paddle-wheels for locomotion	300	00
Iron castings for shafts, horn flange, and cog and driving wheels, 10,000 lbs. at 5 cents per lb.....	500	00
Chain for elevating the carriages, 60 feet of half inch chain, = 500 lbs., at 10 cents.....	50	00
6 iron sheaves for the above, 60 lbs., at 10 cents per lb....	6	00
Coal bunkers under deck for 50 tons of coal, with scuttles, iron grated, on deck.....	75	00
12 berths for crew.....	25	00
2 large anchors, 800 lbs. each, = 1,600 lbs., at \$100 each anchor, 12 $\frac{1}{2}$ cents per lb.....	200	00
2 small anchors for kedging, 200 lbs. each, = 400 lbs., at 12 $\frac{1}{2}$ cents per lb.....	50	00
1 chain cable of 70 fathoms, of $\frac{7}{8}$ -inch best wrought iron, 4,000 lbs., at 10 cents.....	400	00
1 hemp cable 100 fathoms long, of five inches round.....	100	00
2 warp lines of manilla, three inches round, each 100 fathoms long.....	100	00
1 writing table and 6 common chairs.....	12	00
1 stove and pipe for the cabin.....	20	00
1 cooking stove for use of crew.....	35	00
For 4 mud scows of oak, with drop bottoms, the wells to hold 25 cubic yards, at \$375 each.....	1,500	00
4 elevating windlasses, with chains and cogs for working the drop bottoms of the 4 mud scows, at \$18 each.....	72	00
Contingencies, such as extra blacksmith's work, &c.....	240	00

Amount of estimate for a steam dredge boat for Chicago harbor.....	17,500	00
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6. For a set of meteorological instruments for observations at Chicago harbor, Illinois :

For 1 syphon barometer, by James Green, of New York...	\$35 00
For 1 standard thermometer, to be graduated from 240° above, to 42° below zero of Fahrenheit.....	7 50
For 1 wind-gauge, or anemometer of the best construction	65 00
For 1 rain-gauge, best description	22 50
For 1 electrometer, to denote the electrical state of the atmosphere.....	35 00
For 1 cyanometer.	10 00
For 1 hygrometer.....	5 00
For 1 photometer to measure the intensity of the light....	17 50
For 1 geo-thermometer, to measure the earth's temperature near the surface.....	10 00
For 1 sympiesometer, to measure accurately the atmospheric pressure in sudden storms, or in sudden changes	25 00
Amount required.....	<u>232 50</u>

7. For dredging Chicago bar and harbor:

For the excavation and removal of 20,000 cubic yards of light silt, at 10 cents per cubic yard, \$2,000.

NOTE.—Ten cents per cubic yard was the expense of dredging and removing this bar in the summer of 1854, and it is therefore assumed as the proper basis of the estimate now.

Recapitulation of items.

1. For repair of piers in stone masonry	\$115,154 66
2. For repair of second section with oak timber.....	232 89
3. For repair of third section with oak timber.....	1,933 64
4. For machinery, pay of assistants, office rent, fuel for same, stationery, commutation for quarters and fuel of the superintending engineer for one year, survey of harbor, &c.....	7,579 00
5. For a steam dredge boat for Chicago harbor.....	17,500 00
6. For a set of meteorological instruments for Chicago harbor.....	232 50
7. For dredging Chicago bar and harbor.....	2,000 00
Amount of estimates.....	<u>144,932 69</u>
Deduct balance of former appropriation unexpended December 31, 1855.....	<u>6,416 01</u>
Amount of appropriation required for Chicago harbor...	<u>138,516 68</u>

J. D. GRAHAM,

Brevet Lieut. Colonel, Superintending Engineer, &c., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 18.

*Regulation against loading the United States piers with wood, &c.—
Colonel Abert to Mr. William Gamble, United States agent at
Chicago.*

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 29, 1847.

SIR: Your letters of the 14th and 20th instant have been received. No consent can be given to the use of the pier as a wood landing. Of this the steamboat owners should be duly informed. They must be aware that a course so destructive to the piers as the use of them for wood landings will only furnish additional arguments against repairs and further extension of the piers by the government, and lead eventually to the abandonment and entire destruction of the piers. It is hoped that an appeal to their own good sense, and to their interest in the preservation of the harbor piers, will occasion the practice of which you complain to be abandoned, without the necessity of resorting to a suit for damages.

If you have funds to meet the expenses of a survey of the present condition of the harbor the duty can be attended to.

The scows cannot be loaned to the citizens of Racine. Such a course has been so beset with inconveniences and losses that it cannot be persevered in. Moreover, it is doubted if it be lawful to use government property for any other than government purposes under a government agent.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

WILLIAM GAMBLE, Esq.,
United States agent, Chicago, Illinois.

A 19.

REGULATION.—*The United States piers and the United States ground not
to be used for private purposes.*

BUREAU OF TOPOGRAPHICAL ENGINEERS,
August 31, 1849.

SIR: Your letter of the 25th has been received; your course in refusing the use of the pier and the public ground for private purposes is approved. You will not depart from the instructions of the bureau on these subjects.

Although you are recognized as the agent of this office having special charge of the piers, yet the general direction and command

must be considered as vested in the commissioned officer of the corps now stationed there, namely, Lieutenant Webster.

Respectfully,

J. J. ABERT,
Colonel Corps Topographical Engineers.

WILLIAM GAMBLE, Esq.,
United States agent, Chicago.

A 20.

Colonel Abert to Lieutenant J. D. Webster.—The United States piers not to be used for city or private purposes.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
September 3, 1849.

SIR: Your letter of the 29th August and its inclosures have been received. There is no intention of permitting the south pier to be used, of which you will please to inform the mayor. You will also please to show to him my letter to Mr. Gamble, of the 31st August, 1849.

Respectfully,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Lieutenant J. D. WEBSTER,
Corps Topographical Engineers, Chicago.

A 21.

The Secretary of War to Colonel Graham.—Instructions to mark out the lots granted to J. B. Beaubien, granted by the act of August 1, 1854.

WAR DEPARTMENT,
Washington, September 28, 1854.

SIR: By an act for the relief of Jean Baptiste Beaubien, approved August 1, 1854, the Commissioner of the General Land Office is authorized to issue patents to said Beaubien for the following "lots, as described and numbered on the survey and plat of the Fort Dearborn addition to Chicago, in the State of Illinois, made under the order of the Secretary of War, and now on file in the War Office, to wit: lots numbered one, two, three, four, five, and six, of block number four; all that part of lots numbered eight and nine, block number two, which lies south of the line of excavation authorized by the act of Congress approved twenty-first July, eighteen hundred and fifty-two. and all that part of lot numbered one, block number five, that lies within the following boundaries, to wit: commencing on the wester

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line of said lot number one, block five, at a point ten feet north of the southern line thereof; thence east parallel with said southern line two hundred and fifty feet to the western boundary of the lands granted by the United States to the Illinois Central Railroad Company; thence north along said western boundary thirty-four feet to the northern line of said lot number one, block five; thence west along said northern line two hundred and fifty feet to the northwest corner thereof; thence south along the western line thereof thirty-four feet, to the place of beginning."

There does not appear to be now on file in the War Office any such plat as that referred to in the act. Matthew Birchard, by whom, under the order of this department, the Fort Dearborn reservation was surveyed and divided into lots in the year 1839, stated, in a letter dated June 5, of that year, that he would put the plat on record the next day, and send a copy to the department. I am informed that such a plat was filed by him on or about the time specified, and is recorded in book H of maps, on page 322 of Cook county records; and on the 12th of June he forwarded to this department a plat which cannot be found, but which, no doubt, is the copy spoken of in his letter of June 5, and the plat referred to by the act.

You will please refer to the original plat filed by Mr. Birchard, as above, and if it be found, survey the lots described in the act above cited, as laid down on the said plat, after which you will furnish a report and plat showing the ground at present held by the government, with the buildings, &c., thereon, and designating on the same the limits of the lots granted to Beaubien, in order that the department may understand whether the grant to him covers any ground heretofore lawfully disposed of by competent authority.

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

Lieutenant Colonel J. D. GRAHAM,
Corps Topographical Engineers, Chicago, Illinois.

A 22.

Colonel Graham's report to the Secretary of War in relation to a difficulty in the demarcation of the lots granted to J. B. Beaubien. One of the boundaries indefinite, &c.

CHICAGO, ILLINOIS, *February 16, 1855.*

SIR: It has been a source of great regret to me that I have been prevented, until this time, by protracted illness, from executing your order of September 28th last, in laying off the lots granted to Jean Baptiste Beaubien by the act of Congress of August 1, 1854.

The certificates of my attending physician of my illness have been forwarded to the Topographical Bureau, in compliance with the army

regulations. The early stage of my convalescence has been devoted to the performance of this duty, in regard to which I have the honor to submit the following report, and to refer, in illustration, to documents hereto appended, marked as follows, viz:

a. An authenticated copy, from the office of the clerk of the city of Chicago, of the memorial of the mayor and common council of the said city, in regard to being allowed to excavate a portion of the Fort Dearborn reservation for the improvement of the navigation of Chicago river.

A. An authenticated copy, from the same office, of the map or plan filed with the aforesaid memorial.

B. An authenticated copy, from the office of the recorder of Cook county, Illinois, of so much of the map of Fort Dearborn reservation as represents blocks 1, 2, 3, 4, and 5; with their respective lots and the adjacent streets, as surveyed in 1839, under the authority of the War Department, by Matthew Birchard.

C. A map of the aforesaid blocks 1, 2, 3, 4, and 5, with their respective lots and the adjacent streets, as carefully surveyed under my own direction in January, 1855, together with the adjacent part of Chicago river, from careful survey made under my direction in August, 1854. Map B is inaccurate in several of its general features, as will appear by comparing it with map C, derived from recent and careful survey. The lots granted to Mr. Beaubien are, however, so clearly expressed, in written dimensions on map B, that there is no difficulty in laying them off by data thus afforded.

In accordance with this data, I have caused to be surveyed and marked the lots numbered 1, 2, 3, 4, 5, and 6, of block No. 4, as they appear on map C, shaded with red. These lots are bounded in one body, as follows, viz: Beginning at the point A, (map C,) which point is at the intersection of the west margin of Michigan avenue, with the east extremity of the line of division between lots six and nine of block number four, by a line running from thence along the prolongation of the west margin of the said avenue on a magnetic course, at this time, of north $6^{\circ} 35'$ west, a distance of one hundred and fifty-two feet four inches to the point B, at the northeast corner of block four; thence by a line perpendicular to the preceding, on a magnetic course of south $83^{\circ} 25'$ west, a distance of fifty-five feet four inches to the point C, at the northwest corner of the said block four; thence by a line on a magnetic course of south $26^{\circ} 50'$ west, a distance of one hundred and seventeen feet and three inches, to the point D, which is at the intersection of the southeast margin of River street with the northwestern extremity of the line of division between lots four and seven of the said block four; thence by a line on a magnetic course of south $59^{\circ} 45'$ east, a distance of eighty-three feet, to the point E, which is at the intersection of the southeast extremity of the line of division between lots four and seven with the west boundary of lot six, of the said block four; thence by a line on a magnetic course of south $6^{\circ} 35'$ east, or parallel with the west margin of Michigan avenue, a distance of five feet and six inches to the point F, which is the northwest corner of lot nine, of the said block four; thence by a line on a magnetic course of north $83^{\circ} 25'$ east, or perpendicular to

the course of the west margin of Michigan avenue, a distance of fifty-five feet and four inches to the point of beginning, at A.

I have also caused to be surveyed, and marked, all that part of lot number one, in block number five, described in the act of August 1, 1854, as granted to Mr. Beaubien. It is also designated on map C, shaded in red.

The description given in the act of Congress defines sufficiently its boundaries.

In regard to the survey and demarcation of "all that part of lots numbered eight and nine, of block number two, which lies south of the line of excavation, authorized by the act of Congress approved twenty-first of July, eighteen hundred and fifty-two," I have met with the following difficulties, namely:

The first step to be taken in regard to these lots was, to ascertain, and lay down accurately upon the ground, the position of this "line of excavation authorized by the act of Congress approved 21st July, 1852." In the maps of Chicago and the Fort Dearborn reservation, which I found filed in the office of public works here, this line is represented as commencing at the point of intersection of the southeast shore of Chicago river with the prolongation, to the northwest, of the line of demarcation between lots seven and eight of block two, and running thence through the centre of the light-house, and terminating at the interior angle in the United States south pier. In attempting to lay down this line, it was found that these three points are far from being in the same straight line.

A straight line beginning at the first mentioned point and passing to the eastward, through the centre of the base of the light-house, would pass full fifty-seven feet to the north of the interior angle of the south pier.

And a straight line, connecting the two extreme points above mentioned, will pass six feet and four inches south of the centre of the base of the light-house. The only description given in the act of Congress of July 21, 1852, of this line of excavation is contained in its first section, which is as follows, namely:

Be it enacted, &c., "That the corporate authorities of the city of Chicago, Illinois, be, and they are hereby, authorized to excavate such portion of the reservation at Chicago, not exceeding the limits described in their memorial of January five, eighteen hundred and fifty-two, as may be necessary, according to the plan set forth in said memorial, for the improvement of the navigation of the Chicago river."*

The memorial and plan referred to in the act (a, and A, hereto attached,) were sought and obtained in the archives of the corporation of the city of Chicago, under the supposition that they would afford definite data for laying down this line of excavation.

It will be seen, however, that the date of the memorial, as there recorded, is January 15, 1852, instead of January 5, 1852, as quoted in the act of Congress. The memorial describes the line, in its last paragraph, as follows, namely:

* Laws of the first session of the twenty-second Congress, published by George Minot, chapters 67 and 68, page 24.

"Your memorialists therefore pray Congress to pass an act authorizing the city of Chicago to make the said improvement as per the 'red line,' marked on the accompanying map." On referring to the said map (A, hereto attached,) it will be seen that there are *two red lines* and *one blue line* there laid down. Neither of these red lines corresponds with that which is looked upon here as the intended line of excavation. One of these is a broken line running much to the north of the centre of the base of the light-house, and deviating at its angle as much as eighty feet to the north, from the line claimed as the true one.

The other red line begins at the northwest extremity of the line which separates lots seven and eight of block two, as they are laid down on Birchard's map, (B,) and runs thence in a straight line to the *exterior* angle or salient angle of the south pier. This line is represented on the plan accompanying the memorial (map A, hereto attached) as passing entirely to the south of the light-house.

I have caused these three lines (two red and one blue) to be drawn in position on the accompanying map C, to show how differently each would effect the extent of the grant to Beaubien in respect to the portion of lots eight and nine of block two.

I would call the attention of the department to the fact, that on map A the blue line is defined as the "line of proposed excavation, and that it seems to occupy the position understood by the city authorities to be that of the "red line" of the memorial.

To aid me in the execution of the duty assigned me, I would respectfully ask the further instructions of the department, and also that application may be made at the proper quarter for copies of the memorial and plan actually laid before Congress, and upon which the act of July 31, 1852, was based. These may possibly be found to differ from the records of the city of Chicago, hereto attached, marked a and A, and thus solve the difficulty.

On map C the positions and dimensions, according to the scale of all the public buildings, are correctly laid down, together with a reference giving a description of each. The ground held by the government, since the grant to J. B. Beaubien, is as follows, viz: (referring to map C.)

1. The space W X y z, shaded in blue, allotted to the Treasury Department for the use of the marine hospital.

- 2 All that portion of lots numbered 8 and 9, of block 2, not included in the grant to J. B. Beaubien, and all of lot numbered 10, of the said block 2, together with the space between the western boundaries of these three lots and the southeast margin of Chicago river, allotted also to the Treasury Department for the use of the light-house. All of this space, however, not granted to J. B. Beaubien, is subject to be destroyed by the excavation for the improvement of Chicago river, under the act of July 21, 1852.

3. All of the space bounded by the lines shaded in yellow, and designated by the letters m, n, o, D, C, B, A, p, q, r, s, t, u, V, m, remain under the control of the War Department, subject, however, to be diminished by the excavation authorized by the act of July 21, 1852.

The extent of this excavation cannot be correctly designated until

its limits are better understood, as fully explained in a preceding part of this report.

I have the honor to be, very respectfully, sir, your obedient servant,
J. D. GRAHAM,

Major Top. Eng., Brevet Lieut. Colonel.

Hon. JEFFERSON DAVIS,

Secretary of War.

A 23.

The Secretary of War to Colonel Graham.—Instructions to mark out the line of excavation for the improvement of the navigation of Chicago river, including one of Beaubien's boundaries, &c.

WAR DEPARTMENT,

Washington, April 10, 1855.

SIR: Your report of the 16th of February, respecting the survey of the lots granted to J. B. Beaubien, by the act of August 1, 1854, was duly received.

In order to aid in ascertaining the line of excavation authorized by the act of July 21, 1852, application has been made to the office of the Senate for the memorial referred to in that act, and I herewith enclose the papers sent to this department, in answer to that application, viz: a memorial of the city of Chicago, dated January 15, 1852, a map, a report from this department, dated February 18, 1852, and a report from the Topographical Bureau, dated February 14, 1852, with a map.

There is a difficulty with regard to the map referred to in the memorial, as none is found bearing marks which would identify it as the one in question. That accompanying Colonel Abert's report is the only one which is known to have been before the Senate when the act of July 21, 1852, was passed. It would therefore be advisable, in determining the line of excavation, to obtain, if possible, the assent of the parties in interest, viz: the city of Chicago and Mr. Beaubien.

The act of July 21, 1852, requires the Secretary of War to cause the limits of the excavation thereby authorized "to be marked out." This, it appears, has never been done, and I have to request that you will mark out the entire line, in fulfilment of that act, as well as that portion of it which forms one boundary of the land granted to Beaubien.

Very respectfully, your obedient servant,

JEFF'N DAVIS,

Secretary of War.

Lieutenant Colonel J. D. GRAHAM,

Topographical Engineers, Chicago, Illinois.

A 24.

*The Secretary of War to Colonel Graham.*WAR DEPARTMENT,
Washington, August 2, 1855.

SIR: On the 10th of April last instructions were despatched to you from this department to ascertain and mark the line of excavation authorized by the act of July 21, 1852, to be made by the city of Chicago, including a portion thereof which formed the boundary of lots granted to J. B. Beaubien by an act approved August 1, 1854.

It does not appear that this duty has yet been performed, and I have to request your attention to as early an execution of it as circumstances will permit.

Very respectfully, your obedient servant,

JEFF'N DAVIS,
*Secretary of War.*Lieutenant Colonel JAMES D. GRAHAM,
United States Army, Chicago, Illinois.—
[Reply to A 24.]*Colonel Graham to the Secretary of War.*

CHICAGO, ILLINOIS, August 11, 1855.

SIR: I have the honor to acknowledge the receipt of your letter of the 2d instant, and to state that, upon the receipt of your instructions of the 10th of April last, the parties in interest, under the act of July 21, 1852, authorizing the excavation of a portion of the Fort Dearborn reservation for the improvement of the navigation of the Chicago river, were consulted, with a view to obtaining their joint consent, as required by your instructions of April 10, to the demarcation of the line of said excavation under the circumstances of ambiguity in the map alluded to in the aforesaid law, which were set forth in my report to you of the 16th of February last.

I found that, in addition to the city of Chicago and Mr. J. B. Beaubien, there was a third party in interest, namely, the Illinois Central Railroad Company, as will appear on reference to a deed of sale, on file in the War Department, of a portion of the Fort Dearborn reservation to the said company, bearing date October 14, 1852. One of the boundaries under this deed is the line or limit of excavation under the act of July 21, 1852.

It was only after several interviews with one of these parties, and a careful exposition of all the circumstances arising from the ambiguity in the map A, which accompanied my report to you of February 16 last, that his consent was signified to the method proposed of settling this question. At the same time I was requested to pursue still further my search, with a view to discover, if possible, the original map defining the limit of excavation asked for in the memorial of

the city authorities of Chicago, of January, 1852. The property involved in this question had become so valuable that I felt I was in duty bound to respect this request. These investigations have resulted in the proof, to my own mind, that the original map in question is that which is on file in the office of the clerk of the common council of Chicago, of which the one marked A, above mentioned, is a true copy. It appears that instead of leaving that map on file in the office of the United State Senate at Washington, it was brought back and deposited in the office of the clerk of the common council of Chicago, where it now is.

Every attention, without neglecting the other important duties devolving upon me here, has been given to this subject, and the time devoted to it has been in deference to the respective claims urged by the parties in interest, which I desired, if possible, to settle to their mutual satisfaction, otherwise they would have asked for an opportunity to appeal to an explanatory act of Congress.

I have the satisfaction to add that within the ensuing week I expect to have the whole line marked out to the satisfaction of all the parties, and confirmed by their common consent in writing, when I shall make a final report to you, accompanied by a map showing the demarcation.

As the maps and documents which accompanied your instructions of April 10 are no longer required in aid of this subject, they are herewith respectfully returned.

I have the honor to be, very respectfully, your obedient servant,
J. D. GRAHAM,

Major Topographical Engineers, Brevet Lieutenant Colonel.
Hon. JEFFERSON DAVIS,
Secretary of War.

A 25.

Colonel Graham to the Secretary of War.

CHICAGO, ILLINOIS, *September 6, 1855.*

SIR : My final report and map showing the demarcation of the line of excavation under the act of July 21, 1852, and the boundaries of the portions of lots 8 and 9 of block 2 of the Fort Dearborn reservation, granted to Jean Baptiste Beaubien, by the act of August 1, 1854, would have been forwarded to the War Department at the period stated in my letter of the 11th ultimo but for the absence of first one and then another of the parties whose signatures were indispensable to the authentication of these documents.

One of these parties is still absent, and as the day of his return to this city is somewhat uncertain, I have thought it best, in order to avoid further delay in regard to the issue of Beaubien's patent, to report the boundary of the portions of lots 8 and 9 of block 2, which lie south of the line fixed as the limit of excavation, and which all the parties in interest stand bound in good faith to authenticate so soon as they can be brought together.

The following will define the boundary of these fractions of lots 8 and 9 in one entire body, viz:

Beginning at the intersection of the western margin of River street with the southeast extremity of the line of division between lots 7 and 8 of block No. 2 of the Fort Dearborn addition to the city of Chicago, and running thence along the said margin of said street on a magnetic course, at this time, of north $30^{\circ} 15'$ east a distance of ninety-six feet; thence at right angles to the preceding course a distance of thirty-eight feet; thence a distance of one hundred and nine feet, along the circumference of the circular arc bounding the limit for the excavation to be made for the improvement of the navigation of Chicago river, as marked out under the authority of the act of Congress of the 21st of July, 1852, and reaching to the line of division between the aforesaid lots 7 and 8 of block No. 2; thence a distance of eighty-seven feet and six inches along the said line of division between lots 7 and 8 of block No. 2, on a course at right angles to the aforesaid western margin of River street, to the point of beginning.

The above description, together with that contained in my report to the department of the 16th of February last, defining the boundaries of lots numbered 1, 2, 3, 4, 5, and 6, of block No. 4, and that given in the act of August 1, 1854, in regard to a certain portion of lot No. 1 of block No. 5, will define accurately all the lots and parts of lots granted to Jean Baptiste Beaubien by the last mentioned act, and they are all now marked out accordingly on the ground.

So soon as I can get the parties together, the paper and the map containing and defining the whole, as consented to and confirmed by them, will be forwarded to the department.

I have the honor to be, very respectfully, your obedient servant,
J. D. GRAHAM,

Major Topographical Engineers, Brevet Lieutenant Colonel.
Hon. JEFFERSON DAVIS,
Secretary of War, Washington.

A 26.

Colonel Graham to the Secretary of War, communicating the final settlement of the line of excavation at Chicago.

CHICAGO, ILLINOIS, *September 26, 1854.*

SIR: I have the honor to transmit to you herewith a document, marked D, illustrated by a map marked, "map G No. 17," describing, and showing in projection, the line determined and marked out upon the ground as the limit for the excavation of a portion of the public reservation at this place, with a view to the improvement of the navigation of Chicago river, to be done by the corporate authorities of the city of Chicago, as authorized by the act of Congress approved the 21st of July, 1852. The said limit for the excavation is the full or unbroken red line marked upon the map, and designated by the

letters x , A, B, y , and is consented to and ratified by all the parties in interest.

This demarcation has been made under the authority of the aforesaid act of Congress, and your instructions to me dated the 10th of April last. The time occupied in adjusting this matter has been owing to the ambiguity and total uncertainty of the line as described in the memorial, and its accompanying map, addressed to Congress by the mayor and common council of the city of Chicago, of January 15, 1852, upon which the act solely relies for the description of the line, and the explanations and discussions that became necessary to reconcile three parties in interest, especially where two of them were corporate bodies, and when the ground in question had become greatly enhanced in value since the passage of the law in regard to it. I have the satisfaction, however, to state that the line, as now determined and marked out, is far more satisfactory to each and all of the parties in interest than either of the three lines marked on the map, which accompanied the memorial above referred to, would have been. Its description, referring to "map G No. 17," is as follows, viz:

Beginning at the point x , at the interior angle in the United States south pier of Chicago harbor, and running thence westerly a distance of 270 feet on a straight line in prolongation of the interior or river face of the said south pier, as it is now built, eastward of the said interior angle, to the point marked A; thence westerly a distance of 565 feet on another straight line A B, coinciding in direction with the north margin of River street, and occupying the said margin of the said street so far as it is laid down in the plan of the city of Chicago, east of its junction with Michigan avenue; thence westerly and southwesterly a distance of 278 feet along the circumference of the circular arc B y , described on a radius of 498 feet, and tangent at the point B to the straight line A B, and crossing at the point y , the dividing line of lots 7 and 8 of block 2 of the Fort Dearborn addition to the city of Chicago at a distance of $87\frac{1}{2}$ feet, measured perpendicular, from the western margin of that part of River street which lies to the westward of Michigan avenue.

The dotted red line y , C, D, E, F, shows the best practicable mode, it is believed, of continuing the improvement of the navigation of the river by excavation to the southwest of the public ground. This portion of the line was not committed to my attention by your instructions, but it was essential that the line which was so committed should be determined in unison with the best practicable mode of completing the improvement, by the city authorities, beyond the public ground. For this reason I have supposed it proper to project the whole, as represented on the map, thus showing the principle upon which the line, under the act of July 21, 1852, was determined.

The portions of lots 8 and 9 of block 2, granted to Jean Baptiste Beaubien, by the act of Congress approved the 1st of August, 1854, and which lie south of the line of excavation, as above defined, are bounded in one entire body, as follows, viz:

Beginning at the intersection of the western margin of River street with the southeast extremity of the line of division between lots 7 and 8 of block number 2 of the Fort Dearborn addition to the city of Chi-

cago, and running thence along the said margin of River street, on a magnetic course, at this time, of north $30^{\circ} 15'$ east, a distance of ninety-six feet; thence at right angles to the preceding course, a distance of thirty-eight* feet; thence a distance of one hundred and nine feet along the circumference of the circular arc bounding the excavation to be made for the improvement of the navigation of Chicago river, as marked out under authority of the act of Congress of the 21st of July, 1852; and reaching to the line of division between the aforesaid lots seven and eight of block number two, on a course at right angles to the aforesaid western margin of River street, to the point of beginning.

The above description, together with that contained in my report to you of the 16th of February last defining the boundaries of lots numbered one, two, three, four, five, and six, of block number four, and that given in the act of Congress of August 1, 1854, in regard to a part of lot number one of block number five, will define all the lots and parts of lots granted to Jean Baptiste Beaubien by the last mentioned act, and they are all marked out accordingly on the ground.

It will be seen, on reference to the map herewith submitted, that the only remaining portion of United States ground lying south of the line of excavation, other than that appertaining to the marine hospital, is a small fraction of lot ten of block two, having a front of forty-five feet on River street, and a depth of five feet on its northeast boundary and thirty-eight feet on its southwest boundary.

I am requested by Mr. Jean Baptiste Beaubien to state to the department that he has had assurances from reliable sources that it was the design of the framers of the act for his relief, of August 1, 1854, so to have drawn it as to have given to him all the public ground lying south of the line of excavation, except what was reserved for the marine hospital, and the streets provided for in the survey and plat of Matthew Birchard, agent for the War Department, in the year 1839; and Mr. Beaubien therefore requests that the said fraction of lot ten block two which lies south of the line may not be sold or offered for sale until he can have an opportunity of petitioning Congress to pass an explanatory or further act for his relief on this subject. I beg leave respectfully to recommend his request to your favorable consideration, for the reason that, from information I have received from highly respectable sources, I am inclined to think his impressions are well founded.

I would also respectfully recommend that, upon the issuing of Beaubien's patent for the lots granted to him I be authorized to open Michigan avenue and River street to the extent laid down on Birchard's map, marked B, which was submitted with my report to you of the 16th of February last, and that the municipal jurisdiction over the said portions of the said streets be surrendered to the corporate authorities of the city of Chicago so soon as the public buildings thereon can be disposed of, and the public property stored therein moved out.

I am notified by the mayor of the city that the corporate authorities

* The length of this line was given, in my letter to the department of the 6th instant, as forty-five feet. I beg that it may be there corrected to read thirty-eight feet.

are preparing to begin the excavation immediately, and that they request that possession may be given them of the ground for that purpose, as soon as the public interests will allow. I would recommend, in pursuance of this request, that proposals be invited until the 15th of November for the purchase, and removal within twenty days thereafter from the ground authorized to be excavated, and from that laid out in the streets on Birchard's plat, of all the public buildings now standing thereon, excepting the light-house.

It will be seen that provision is made in document D that no excavation shall be made nearer than twenty feet from the exterior of any part of the base of that building (and that any such excavation shall have a slope outward of $33\frac{1}{2}^{\circ}$ with the horizon) until after the new light-house designed for this harbor shall have been completed and lighted, and measures adopted by the Treasury Department for the disposal of the present building.

The map herein referred to, being too large for the mail, is this day forwarded by express. It is sent in duplicate, supposing that one may be required for the General Land Office.

I have the honor to be, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Major Top. Eng., Brevet Lieutenant Colonel.

Hon. JEFFERSON DAVIS,

Secretary of War, Washington.

P. S.—This report would have been forwarded on the 20th instant, but for my having been obliged, on the 19th, to go to Waukegan to endeavor to save a large amount of public property from destruction by the violent storm then prevailing, and which continued for several days, doing great damage to the shipping, to wharves, &c. There being no agent at Waukegan, other than the foreman, or master workman, a proper attention to the safety of this property devolved on me personally.

Very respectfully,

J. D. GRAHAM,

Major Topographical Engineers, Brevet Lieutenant Colonel.

—
D, accompanying report marked A 26.

Whereas, under an act of Congress approved the twenty-first of July, 1852, entitled "An act to authorize the mayor and common council of Chicago, Illinois, to excavate a portion of the public reservation of that place, with a view to the improvement of the navigation of Chicago river," and under another act of Congress approved the first of August, 1854, entitled "An act for the relief of Jean Baptiste Beaubien," and under a deed of sale from Charles M. Conrad, Secretary of War, dated the fourteenth of October, 1852, and bearing the seal of War Office of the United States, conveying to the Illinois Central Railroad Company a portion of the public land "known as the Fort Dearborn reservation at Chicago, in Cook county,

Illinois," we, the undersigned, are parties in interest, or the legal representatives of parties in interest, involved by the land to be excavated by authority of the aforesaid act of the twenty-first of July, 1852.

And whereas, there is doubt and uncertainty in regard to the extent of the ground that may be excavated under the aforesaid act of the twenty-first of July, 1852, arising from an ambiguity in the map which accompanied the memorial of the mayor and common council of the city of Chicago, addressed in January, 1852, to the Senate and House of Representatives of the United States, which ambiguity likewise affects the interest of the Illinois Central Railroad Company, under the aforesaid deed of sale from C. M. Conrad, Secretary of War, bearing date the fourteenth of October, 1852, and the interests of Jean Baptiste Beaubien under the aforesaid act of the first of August, 1854.

And whereas, Brevet Lieutenant Colonel James D. Graham, of the United States corps of topographical engineers, was directed by the War Department, on the tenth of April, 1855, to mark out the entire line of excavation under the act of the twenty-first day of July, 1852, as well as that portion of which it forms one boundary of the land granted to Beaubien, and advising, at the same time, that the consent of the parties in interest should, if possible, be obtained thereto.

And whereas, after full consultations with the aforesaid parties and the representatives of parties in interest, and in fulfillment of the aforesaid directions of the War Department of April the tenth, 1855, the said Brevet Lieutenant Colonel James D. Graham has marked out the following as the line or limit of the excavation to be made by the corporate authorities of the city of Chicago, under the authority of the aforesaid act of Congress of the twenty-first of July, 1852, and has designated the same by the red line $x A B y$ on the accompanying map, called "Map G, No. 17," as follows, to-wit:

Beginning at the point x at the interior angle in the United States south pier of Chicago harbor, and running thence westerly a distance of two hundred and seventy feet on a straight line in prolongation of the interior or river face of the said south pier, as it is now built eastward to the said interior angle to the point marked A ; thence westerly a distance of five hundred and sixty-five feet on another straight line $A B$, coinciding in direction with the north margin of River street, and occupying the said margin of the said street so far as it is laid down on the plat or plan of the city of Chicago east of its junction with Michigan avenue, thence westerly and southwesterly a distance of two hundred and seventy-eight feet, along the circumference of the circular arc $B y$ described on a radius of four hundred and ninety-eight feet, and tangent at the point B to the straight line $A B$, and crossing at the point y the dividing line of lots seven and eight, of block number two of the Fort Dearborn addition to the city of Chicago at a distance of eighty-seven feet and six inches, measured perpendicularly from the western margin of that part of River street which lies to the westward of Michigan avenue: *Provided*, That no excavation shall be made within the distance of twenty feet from the exterior of any part of the base of the present light-house, and that any such excavation when made shall have a slope outward of

thirty-three and a half degrees with the horizon, or in the ratio of two feet perpendicular to three feet of base, until after the new light-house designed for Chicago harbor shall have been completed and lighted, and measures adopted by the Treasury Department for the disposal of the present light-house.

Now, therefore, be it known to all and singular whom it may concern, that we, the undersigned parties and legal representatives of parties in interest, as aforesaid, do hereby severally and jointly, of our own free will, and in consideration of the benefits to be derived therefrom by all and singular of the said parties, consent, ratify and confirm the aforesaid line and limit of excavation determined as above stated, in fulfilment of the aforesaid acts of Congress of the twenty-first of July, 1852, and the first of August, 1854, and the aforesaid deed of sale from C. M. Conrad, Secretary of War, to the Illinois Central Railroad Company, dated the fourteenth of October, 1852, as bounding and defining the extent of the rights of all and each of the aforesaid parties in interest under the aforesaid acts of Congress and deed of sale, together with the *proviso* herein above stated.

In testimony whereof, we have hereunto, and also to the accompanying map, called "map G No. 17," affixed our hands and seals, at the city of Chicago, in Cook county, in the State of Illinois, this twenty-sixth day of September, in the year of our Lord eighteen hundred and fifty five.

JEAN BT. BEAUBIEN. [L. S.]

For the Illinois Central Railroad Company:

J. N. A. GRISWOLD, *President*. [L. S.]

For the corporation of the city of Chicago:

L. D. BOONE, *Mayor*. [L. S.]

Attest:

H. W. ZIMMERMAN, *City Clerk*.

For the United States:

JAMES D. GRAHAM, [L. S.]

Major Topographical Engineers, Brevet Lieutenant Colonel.

Witness:

TH. HOYNE.

JOHN C. MORFIT.

BENJ. F. JOHNSON.

A 27.

DEED FROM THE UNITED STATES TO THE ILLINOIS CENTRAL RAILROAD COMPANY.

The United States of America. To all to whom these presents shall come, greeting:

Whereas the military site of Fort Dearborn, commonly known as Fort Dearborn reservation, at Chicago, in Cook county, Illinois, has become useless for military purposes, and the part thereof hereinafter de-

scribed not being used or necessary for the site of a fort, or for any other authorized purpose, has been sold by the Secretary of War, under the direction of the President of the United States, pursuant to "An act authorizing the sale of certain military sites," approved March 3, 1819, and an act in addition to an act entitled "An act to provide for the sale of lands conveyed to the United States in certain cases, and for other purposes," passed the 26th day of May, 1824, approved April 28, 1828, for the sum of forty-five thousand dollars, to the Illinois Central Railroad Company, and the said sum has been paid into the treasury of the United States:

Now know ye, that the United States of America, in consideration of the premises, have given and granted, and do by these presents give and grant, unto the Illinois Central Railroad Company, all that portion of the military site or reservation of Fort Dearborn, bounded as follows, that is to say:

1st. On the south by the southern boundary of said reservation, designated on the map hereto annexed as lying between the points "1, e."

2d. On the west by a line commencing at a point marked "1" on the said map, in the said southern boundary, distant two hundred and fifty feet eastwardly from the eastern line of Michigan avenue, and running thence northward and parallel to said Michigan avenue to the piers in Chicago river forming the harbor of said city at a point marked "2" on said map.

3d. On the north by a line running with said piers from the termination of the line last above described at the said point marked "2" eastward to low-water mark of lake Michigan, subject, however, to the right of the city of Chicago to make an excavation for improving the navigation of Chicago river, granted by "An act to authorize the mayor and common council of Chicago, Illinois, to excavate a portion of the public reservation at that place, with a view to the improvement of the navigation of Chicago river," approved July 21, 1853, without any claim for indemnity or reimbursements of any part of the price above mentioned in consequence of such excavations, if made.

4th. On the east by low-water mark of lake Michigan, together with all the accretions made or to be made by said lake and river in front of the land hereby conveyed, and all other rights and privileges appertaining to the United States as owners of said land.

To have and to hold the herein before described lot or parcel of land, with the appurtenances, unto the Illinois Central Railroad Company, and the successors and assigns of said company, to its and their proper use for ever.

In testimony whereof, the Hon. Charles M. Conrad, Secretary of War, hath hereunto set his hand and the seal of the War Department, this fourteenth day of October, in the year one thousand eight hundred and fifty two.

[I. S.]

C. M. CONRAD.
Secretary of War.

A 28.

An act to authorize the mayor and common council of Chicago, Illinois, to excavate a portion of the public reservation at that place, with a view to the improvement of the navigation of Chicago river.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the corporate authorities of the city of Chicago, Illinois, be, and they are hereby, authorized to excavate such portion of the reservation at Chicago, not exceeding the limits described in their memorial of January 5, 1852, as may be necessary, according to the plan set forth in said memorial, for the improvement of the navigation of the Chicago river.

SECTION 2. *And be it further enacted, That the Secretary of War be, and he is hereby, directed to cause the limits above designated to be marked out, and to make such disposition of the buildings now standing within said limits as may be best for the public interest.*

Approved July 21, 1852.

A 29.

[Or A, as referred to in the original of Colonel Graham's report to the Secretary of War, of February 16, 1854. See A 22 of this series.]

Memorial of the mayor and common council of the city of Chicago to the Senate of the United States, of January 15, 1852.

To the Senate of the United States:

The memorial of the mayor and common council of the city of Chicago respectfully represents: That in the Chicago river, which constitutes the harbor of said city, there is a short or sudden bend, near its junction with Lake Michigan, which renders the navigation of the river and the entrance to the harbor unsafe; that if the said river could be straightened, by cutting off the said bend and widening the river to that extent, it would remove, in a great measure, the difficulty and danger to the navigation; that the United States owns the land, or nearly all of it, where said cut off would be made; that said land was reserved by the United States at an early day for military purposes, but has long since ceased to be used for such purposes.

In consideration of the premises, your memorialists pray Congress for permission to said city to straighten the channel of said river, by making the said cut off across the land belonging to the United States, as aforesaid.

The memorialists do not ask for any grant of land or appropriation of money; they only ask for permission to make the said improvement at the expense of the city, for the public benefit, and the protection of the commerce of the whole line of lakes.

Your memorialists, therefore, pray Congress to pass an act authorizing the city of Chicago to make the said improvement, as per the "red line" marked on the accompanying map; and, as in duty bound, your petitioners will ever pray.

W. S. GURNEE,
Mayor of the city of Chicago,
by authority of and on behalf of the common council of said city.
CHICAGO, January 15, 1852.

STATE OF ILLINOIS, }
City of Chicago, } ss.

I, H. W. Zimmerman, clerk of the city of Chicago aforesaid, do hereby certify that the foregoing is a true copy of a memorial to the Senate of the United States, by W. S. Gurnee, mayor of the city of Chicago, by authority of and on behalf of the common council of said city, under date of January 15, 1852.

Witness my hand and the corporate seal of said city, this 20th day
[L s.] of January, A. D. 1855.

H. W. ZIMMERMAN, *City Clerk.*

A 30.

An act for the relief of Jean Baptiste Beaubien.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Commissioner of the General Land Office be, and he is hereby, authorized to issue a patent or patents to Jean Baptiste Beaubien for the following lots, as described and numbered on the survey and plat of the Fort Dearborn addition to Chicago, in the State of Illinois, made under the order of the Secretary of War, and now on file in the War Office, to wit: lots numbered one, two, three, four, five, and six, of block number four; all that part of lots numbered eight and nine, block number two, which lies south of the line of excavation authorized by the act of Congress approved twenty-first July, eighteen hundred and fifty-two; and all that part of lot number one, block number five, that lies within the following boundaries, to wit: commencing on the western line of said lot number one, block five, at a point ten feet north of the southern line thereof; thence east, parallel with said southern line, two hundred and fifty feet, to the western boundary of the lands granted by the United States to the Illinois Central Railroad Company; thence north along said western boundary thirty-four feet to the northern line of said lot number one, block five; thence west along said northern line two hundred and fifty feet to the northwest corner thereof; thence south along the western line thereof thirty-four feet to the place of beginning.

Approved August 1, 1854.

A 31.

A register of the relative heights and fluctuations of the surface of Lake Michigan, from observations made under the direction of Lieutenant Colonel J. D. Graham, on a permanent tide-gauge, fixed at the east extremity of the United States north pier of Chicago harbor, between September 1, 1854, and December 31, 1855.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
			Course.	Strength.
1854.				
September 1	12 noon	3. 10	Southwest	Light breeze
2	do	2. 90	do	do
3	do	3. 00	Southsouthwest	do
4	do	2. 90	Southwest	do
5	do	2. 80	do	do
6	do	2. 90	Northwest	Fresh breeze
7	8 a. m	2. 90	Northeast	do
7	12 noon	3. 20	do	do
8	8 a. m	2. 72	South	Light breeze
8	12 noon	3. 11	Southeast	Fresh breeze
9	8 a. m	3. 35	Northeast	do
9	4 p. m	3. 30	North	do
10	8 a. m	2. 80	Southwest	Light breeze
11	do	2. 72	Southeast	do
12	9 a. m	2. 65	North	do
13	8 a. m	3. 10	Southsoutheast	Fresh breeze
14	12 noon	2. 90	Northeast	Light breeze
15	8 a. m	3. 10	North	Fresh breeze
15	5 p. m	3. 12	do	do
16	8 a. m	2. 79	East	Light breeze
17	do	2. 75	Southeast	Fresh breeze
18	do	2. 50	South	Light breeze
19	do	2. 25	West	do
20	do	2. 75	Northwest	Fresh breeze
21	do	2. 53	do	Light breeze
22	do	2. 38	Southwest	do
23	do	2. 05	South	do
24	do	2. 12	Southwest	do
25	do	2. 38	do	do
26	do	2. 25	do	do
27	do	2. 38	West	do
28	do	2. 28	Northeast	do
28	4 p. m	2. 38	Southeast	do
29	8 a. m	2. 68	East	do
30	do	2. 48	Southeast	do
October 1	do	2. 10	West	do
2	do	2. 50	East	Fresh breeze
3	do	1. 85	West	do
3	5 p. m	1. 95	do	do
4	8 a. m	2. 75	Northwest	do
5	do	1. 10	Southwest	do
6	do	1. 85	do	do
7	do	2. 05	South	Light breeze
8	do	2. 24	Southwest	do

NOTE.—Average height, as per tide-gauge, for September, 1854, 2. 79.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
			Course.	Strength.
1854.				
October 9	8 a. m	2.30	West	Light breeze
10	do	2.60	Southeast	do
11	do	2.00	do	Fresh breeze
12	do	2.40	North	Light breeze
13	do	2.55	East	Fresh breeze
14	do	3.15	North	Light breeze
15	do	2.20	do	do
16	do	2.40	do	do
17	do	2.10	West	do
18	do	2.38	North	do
19	do	2.10	Southwest	do
20	do	2.00	Southeast	Fresh breeze
21	do	2.20	do	Light breeze
22	do	2.10	South	do
23	do	2.65	North	Fresh breeze
24	do	2.15	do	Light breeze
25	do	2.10	Southeast	do
26	do	2.18	do	do
27	do	2.20	do	do
28	do	2.44	do	do
29	do	2.45	Northeast	do
30	do	2.50	East	Fresh breeze
31	do	2.40	Northeast	Light breeze
November 1	do	1.80	West	Fresh breeze
2	do	1.90	South	do
3	do	2.45	North	do
4	do	2.35	do	Light breeze
5	do	1.80	South	do
6	do	1.30	West	do
7	do	1.95	do	do
8	do	2.05	do	do
9	do	1.90	South	do
10	do	2.10	do	Fresh breeze
11	do	1.15	West	do
12	do	2.15	Northwest	do
13	do	2.40	West	do
14	do	1.65	South	Light breeze
15	do	2.40	Northwest	do
16	do	2.10	do	do
17	do	1.90	West	do
18	do	2.20	Northwest	do
19	do	2.10	West	do
20	do	1.70	South	do
21	do	2.10	Southeast	do
22	do	1.70	Southwest	do
23	do	1.72	South	do
24	do	2.15	Northwest	do
25	do	1.90	West	do
26	do	2.10	Northwest	do
27	do	1.80	Southwest	do
28	do	1.40	West	do
29	do	2.10	Northwest	do

NOTE.—Average height, as per tide-gauge, for October, 1854, 2.22.

NOTE.—Average height, as per tide-gauge, for November, 1854, 1.95.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
			Course.	Strength.
1854.				
November 30	8 a. m	2. 12	Northwest	Light breeze
December 1	do	1. 95	West	do
2	do	1. 65	do	do
3	do	2. 70	Northwest	Fresh breeze
4	do	2. 75	do	do
5	do	1. 80	West	do
6	do	1. 15	do	do
7	do	2. 00	Northwest	Light breeze
8	do	1. 80	Southwest	do
9	do	1. 10	do	Fresh breeze
10	do	1. 45	West	Light breeze
11	do	1. 55	Northwest	do
12	do	1. 65	Southwest	do
13	do	1. 45	West	do
14	12 noon	1. 75	South	do
15	do	1. 70	Northwest	do
16	do	1. 80	Southwest	do
17	do	2. 75	Northeast	Fresh breeze
18	do	2. 57	Northwest	do
19	do	Tide-gauge frozen tight.	do	Light breeze
20	do	Frozen	West	do
21	do	do	do	do
22	do	do	Southwest	do
23	do	do	Southeast	do
24	do	do	South	do
25	do	do	Southwest	do
26	do	2. 12	Southeast	do
27	do	2. 10	do	do
28	do	2. 22	Northwest	Fresh breeze
29	do	1. 65	do	Light breeze
30	do	1. 75	do	do
31	do	1. 62	do	do

NOTE.—Average height, as per tide-gauge, for December, 1854, 1. 87.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Weather.
			Course.	Strength.	
1855.					
Jan. 1	12 noon	2. 00	South	Light breeze.	
2	do	1. 62	do	Fresh breeze.	
3	do	1. 40	do	do	
4	do	1. 40	West	Light breeze.	

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Weather.
			Course.	Strength.	
1855.					
Jan. 5	12 noon	1. 90	East	Fresh breeze.	
6	do	2. 00	Southeast	Light breeze.	
7	do	1. 00	South	do	
8	do	1. 40	do	do	
9	do	1. 32	Southwest	do	
10	do	1. 45	Southeast	do	
11	do	1. 40	South	do	
12	do	2. 10	Northeast	do	
13	do	2. 20	Northwest	Fresh breeze.	
14	do	1. 00	South	do	
15	do	1. 30	do	Light breeze.	
16	do	2. 00	do	do	
17	do	1. 40	Southwest	do	
18	do	1. 65	Northwest	do	
19	do	1. 70	Southeast	Fresh breeze.	
20	do	2. 00	Northeast	Light breeze.	
21	do	Tide-gauge frozen tight	East	Fresh breeze.	Heavy snow storm
22	do	Frozen	West	do	Snow 18 inches deep
23	do	do	Southwest	Light breeze.	
24	do	do	South	do	
25	do	do	West	do	
26	do	do	Northwest	do	
27	do	do	South	do	
28	do	do	East	Fresh breeze.	
29	do	do	Northeast	do	
30	do	do	West	Light breeze.	
31	do	do	Southwest	do	
Feb. 1	do	Tide-gauge frozen tight	Northwest	do	
2	do	do	South	do	
3	do	do	Northwest	do	
4	do	do	East	do	
5	do	do	Northwest	do	
6	do	do	Southeast	do	
7	do	do	East	do	
8	do	do	Northeast	do	
9	do	do	Northwest	do	
10	do	do	Southeast	do	
11	do	do	South	do	
12	do	do	do	do	Raining, snow melting
13	do	do	do	do	do
14	do	do	Northeast	Fresh breeze.	Snow storm
15	do	do	Northwest	do	
16	do	do	West	Light breeze.	Pleasant weather
17	do	do	North	do	do
18	do	do	Northwest	do	do
19	do	do	do	do	do
20	do	do	West	do	do
21	do	do	South	do	do
22	do	do	Northeast	do	do
23	do	do	North	Fresh breeze.	
24	do	do	Northwest	Light breeze.	Pleasant weather

NOTE.—Average height, as per tide-gauge, for twenty days of January, 1855, 1. 61.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Weather.
			Course.	Strength.	
1855.					
Feb. 25	12 noon	Tide-gauge frozen tight	West	Fresh breeze.	
26	do	do	Southwest	do	
27	do	do	West	Light breeze.	
28	do	do	South	do	

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
			Course.	Strength.
1855.				
March 1	12 noon	Tide-gauge frozen tight.	South	Light breeze.
2	do	do	do	do
3	do	do	West	do
4	do	do	South	do
5	do	do	do	Fresh breeze.
6	do	do	East	do
7	do	do	Northeast	Light breeze.
8	do	do	South	Fresh breeze.
9	do	do	Northwest	Light breeze.
10	do	2.00 by mark on pier; frozen.	Southeast	Fresh breeze.
11	do	Frozen	South	do
12	do	do	East	do
13	do	do	Southwest	do
14	do	do	West	Light breeze.
15	do	do	do	do
15	5 p. m.	2.10	do	do
16	8 a. m.	2.00	East	Fresh breeze.
16	12 noon	2.10	do	do
17	do	2.10	West	do
18	do	1.90	Southwest	Light breeze.
19	do	1.35	West	Fresh breeze.
20	do	1.40	do	do
21	do	1.75	Northwest	Light breeze.
22	do	1.60	do	do
23	do	1.65	West	Fresh breeze.

A 31—Continued.

Date.		Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
				Course.	Strength.
1855.					
March	24	12 noon	2. 12	Northwest	Fresh breeze
	25	do	1. 40	West	do
	26	do	1. 20	do	do
	27	do	2. 00	Northeast	do
	28	do	2. 00	Northwest	do
	29	do	1. 50	West	do
	30	do	1. 60	do	do
April	31	do	1. 65	Southwest	do
	1	do	2. 00	Northwest	do
	2	do	1. 75	East	Light breeze
	3	do	1. 80	do	do
	4	do	1. 85	Southeast	do
	5	do	1. 75	East	do
	6	do	2. 10	Northeast	Fresh breeze
	7	do	1. 45	South	do
	8	do	1. 45	East	Light breeze
	9	do	1. 60	West	Fresh breeze
	10	do	1. 80	Northwest	do
	11	do	1. 75	Northeast	Light breeze
	12	do	1. 72	do	do
	13	do	1. 80	Southwest	do
	14	do	1. 60	South	do
	15	do	1. 58	East	do
	16	do	1. 70	South	do
	17	do	1. 80	do	Fresh breeze
	18	do	1. 60	West	do
	19	do	1. 20	Southwest	Light breeze
	20	do	1. 90	Northeast	do
	21	do	1. 65	Southwest	Fresh breeze
	22	do	1. 62	Northeast	Light breeze
	23	do	1. 80	Southwest	do
	24	do	1. 62	West	Fresh breeze
	25	do	1. 65	South	Light breeze
	26	do	1. 90	Northeast	Fresh breeze
	27	do	1. 95	East	Light breeze
	28	do	1. 85	South	Fresh breeze
	29	do	1. 82	Southwest	Light breeze
	30	do	1. 85	do	Fresh breeze
May	1	do	2. 80	Northeast	Strong gale
	2	do	2. 75	do	Fresh breeze
	3	do	2. 75	do	do
	4	do	2. 45	do	do
	5	do	2. 20	do	Light breeze
	6	do	2. 25	do	do
	7	8 a. m	2. 85	North	Strong gale
	7	12 noon	2. 92	do	do
	8	do	2. 70	Northeast	Fresh breeze
	9	do	2. 50	do	do
	10	do	2. 32	do	Light breeze
	11	do	2. 05	East	do
	12	do	2. 15	Southwest	do
	13	do	2. 00	West	do

NOTE.—Average height, as per tide-gauge, for 19 days of March, 1855, 1. 65.

NOTE.—Average height, as per tide-gauge, for April 1855, 1. 73.

A 31—Continued.

Date.		Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		
				Course.	Strength.	
1855.						
May	14	12 noon	2. 30	South	Light breeze	
	15	do	2. 05	do	Fresh breeze	
	16	do	2. 40	Northeast	do	
	17	do	2. 40	do	do	
	18	do	2. 60	do	do	
	19	do	2. 10	East	Light breeze	
	20	do	2. 05	do	do	
	21	do	1. 70	South	do	
	22	do	2. 35	Southeast	do	
	23	do	2. 05	Northeast	do	
	24	do	2. 30	North	Fresh breeze	
	25	do	2. 10	do	do	
	26	do	2. 55	East	Light breeze	
	27	do	2. 50	do	do	
	28	do	2. 45	Northeast	do	
	29	do	2. 35	do	do	
	30	do	2. 40	South	do	
	31	do	2. 05	Northwest	do	
	June	1	do	2. 75	North	A gale
		2	8 a. m	3. 00	do	do
		2	12 noon	3. 10	do	do
		3	do	2. 30	East	Light breeze
		4	do	2. 30	do	do
		5	do	2. 30	Southeast	do
		6	do	2. 40	do	do
		7	do	2. 50	Northeast	do
		8	do	2. 30	Northwest	do
		9	do	2. 43	Southeast	do
		10	do	2. 30	North	do
		11	do	2. 40	do	do
		12	do	2. 35	East	do
13		do	2. 35	do	do	
14		do	2. 20	Southeast	do	
15		do	2. 15	South	do	
16		do	2. 30	Southeast	do	
17		do	2. 45	Northeast	do	
June		18	do	2. 65	Southeast.	do
		19	do	2. 62	Northeast.	do
		20	do	2. 50	East	do
		21	do	2. 65	Northeast.	Fresh breeze
		22	do	2. 70	North	do
		23	do	2. 70	do	do
		24	do	2. 50	East	Light breeze
		25	do	2. 55	do	do
		26	do	1. 90	Southwest	Fresh breeze
		27	do	2. 25	South	do
		27	2 p. m	4. 00	Southwest	A gale
		27	2 $\frac{1}{4}$ p. m	2. 60	do	do
		27	2 $\frac{1}{2}$ p. m	3. 00	South	do
	27	2 $\frac{3}{4}$ p. m	2. 00	do	do	
	27	3 p. m	1. 40	Southeast.	Fresh breeze	
	27	3 $\frac{1}{4}$ p. m	1. 60	do	do	
	27	3 $\frac{1}{2}$ p. m	2. 45	South	do	

NOTE.—Average height, as per tide-gauge, for May, 1855, 2. 40.

A 31—Continued.

Date.		Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		
				Course.	Strength.	
1855.						
June	27	3 $\frac{3}{4}$ p. m.	2.75	Southeast.	Fresh breeze	
	27	4 p. m.	2.10	Southwest	do	
	27	4 $\frac{1}{4}$ p. m.	2.15	do	do	
	27	4 $\frac{1}{2}$ p. m.	2.20	do	do	
	27	4 $\frac{3}{4}$ p. m.	2.25	do	Light breeze	
	27	5 p. m.	2.60	do	do	
	27	5 $\frac{1}{4}$ p. m.	2.00	do	do	
	27	5 $\frac{1}{2}$ p. m.	2.45	do	do	
	27	5 $\frac{3}{4}$ p. m.	2.60	do	do	
	27	6 p. m.	3.65	do	do	
	27	6 $\frac{1}{2}$ p. m.	2.50	do	do	
	27	7 p. m.	2.10	do	do	
	28	9 a. m.	2.50	do	do	
	28	12 noon	2.90	do	do	
	28	3 p. m.	2.45	South	do	
	29	9 a. m.	2.50	do	do	
	29	12 noon	2.25	do	do	
	29	3 p. m.	2.30	do	do	
	30	12 noon	2.50	Southwest	do	
	July	1	do	2.40	West	Fresh breeze
		2	do	2.35	East	Light breeze
		3	do	2.65	Southwest	do
		4	do	2.60	Northeast.	do
		5	do	2.35	Southeast.	do
		6	do	2.70	Northeast.	do
		7	do	2.62	do	do
		8	do	2.55	Southwest	do
		9	9 a. m.	3.00	do	do
		9	10 a. m.	3.00	West	do
9		11 a. m.	2.00	do	do	
9		12 noon	3.20	do	do	
10		do	2.75	East	do	
11		do	2.72	West.	do	
12		do	2.85	North.	do	
13		do	2.85	Northeast.	do	
14		do	2.65	East	do	
15		do	2.60	Southwest	do	
16		do	2.52	do	do	
17		do	2.35	do	do	
18		do	2.55	South	do	
19		do	2.50	do	do	
20		do	3.00	North.	Fresh breeze	
21		do	2.90	do	Light breeze	
22		do	2.95	Northeast	do	
23		do	3.00	North.	Fresh breeze	
24		do	2.80	do	Light breeze	
25		do	3.00	Northeast.	do	
26		do	2.70	South	do	
27		do	2.75	West	do	
28		do	3.15	Southeast.	do	
29	do	2.85	East	do		
30	do	3.00	North.	do		
31	do	2.95	do	do		

NOTE.—Average height, as per tide-gauge, for June, 1855, 2.63.

NOTE.—Average height, as per tide-gauge, for July, 1855, 2.72.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
			Course.	Strength.
1855.				
August 1	12 noon	3.25	East	Light breeze
2	do	2.60	do	do
3	do	2.50	Southeast.	do
4	do	3.12	North.	Fresh breeze
5	do	3.20	do	do
6	do	2.75	do	do
7	do	2.85	Southeast	Light breeze
8	do	2.75	Southwest	Fresh breeze
9	do	2.60	West.	Light breeze
10	do	2.70	East	do
11	do	2.82	Southwest	Fresh breeze
12	do	2.65	East	Light breeze
13	do	2.80	North.	do
14	do	2.85	East	do
15	do	2.82	Southwest	do
16	do	2.60	North.	do
17	do	2.40	West.	Fresh breeze
18	do	2.62	East	Light breeze
19	do	2.50	Southwest	Fresh breeze
20	do	2.32	do	do
21	do	2.80	West.	Light breeze
22	do	3.00	North.	Fresh breeze
23	do	2.75	East	Light breeze
24	do	2.70	Southwest	do
25	do	2.80	do	do
26	do	4.00	North.	A gale
26	3 p. m.	3.50	do	do
27	12 noon	3.20	do	Fresh breeze
28	do	2.70	East	Light breeze
29	do	3.10	West.	do
30	do	2.50	East	Fresh breeze
30	2 p. m.	3.52	do	do
30	3 p. m.	4.00	Southeast.	do
30	4 p. m.	3.50	Northeast	do
31	12 noon	3.00	Southwest	Light breeze
September 1	do	2.50	do	do
2	do	2.80	North.	do
3	do	3.10	do	Fresh breeze
3	4 p. m.	3.30	do	Gale
3	5 p. m.	3.40	do	do
4	12 noon	3.00	Northeast.	Fresh breeze
5	do	2.90	North.	Light breeze
6	do	2.90	do	do
7	do	2.75	East	do
8	do	2.85	South	do
9	do	2.90	North	do
10	do	2.95	Southeast	do
11	do	2.65	South	Fresh breeze
12	do	2.80	Southwest	Light breeze
13	do	3.10	North	Fresh breeze
14	do	2.95	East	Light breeze

NOTE.—Average height, as per tide-gauge, for August, 1855, 2.83.

A 31—Continued.

Date.		Time of obser- vation.	Surface of lake, per tide-gauge, in feet and de- cimals.	Wind.		
				Course.	Strength.	
1855.						
Sept'r	15	12 noon	2. 50	Southwest	Fresh breeze	
	16	do	2. 80	Northeast	Light breeze	
	17	do	2. 80	South	do	
	18	9 a. m	4. 00	North	Gale	
	18	12 noon	4. 10	do	do	
	18	3 p. m	4. 30	do	do	
	19	12 noon	3. 60	East	do	
	20	do	2. 75	Northeast	Light breeze	
	21	do	3. 35	North	do	
	22	do	2. 80	Northeast	Fresh breeze	
	23	do	2. 85	Southeast	Light breeze	
	24	do	3. 00	Southwest	do	
	25	do	2. 75	do	do	
	26	do	2. 95	Northwest	do	
	27	do	2. 85	East	do	
	28	do	2. 62	South	Fresh breeze	
	29	do	2. 65	do	do	
	30	do	3. 00	North	do	
	October	1	do	2. 70	West	do
		2	do	3. 60	North	A gale
		3	do	2. 75	Southwest	Light breeze
		4	do	3. 00	North	do
		5	do	2. 60	Northwest	do
		6	do	2. 80	do	do
		7	do	2. 50	West	do
		8	do	2. 75	Northeast	do
		9	do	2. 55	West	do
		10	do	2. 80	Southwest	do
		11	do	3. 00	North	Fresh breeze
		12	do	3. 15	do	do
13		do	2. 80	East	Light breeze	
14		do	2. 60	Southwest	do	
15		do	3. 10	North	Fresh breeze	
16		do	2. 80	do	Light breeze	
17		do	2. 40	South	do	
18		do	2. 35	do	do	
19		do	2. 55	East	do	
20		do	2. 95	North	Fresh breeze	
21		do	3. 00	West	do	
22		do	2. 80	North	do	
23		do	3. 10	do	do	
24		do	3. 30	do	do	
25		do	2. 90	Southwest	Light breeze	
26		do	2. 25	West	Fresh breeze	
27		do	2. 35	Southwest	Light breeze	
28		do	2. 50	East	do	
29		do	2. 60	South	Fresh breeze	
30		do	2. 50	North	Light breeze	
31		do	2. 50	South	do	
Nov'r	1	do	2. 60	North	do	
	2	do	2. 95	Northeast	Fresh breeze	
	3	do	2. 80	do	do	

NOTE.—Average height, as per tide-gauge, for September, 1855, 2.92.

NOTE.—Average height, as per tide-gauge, for October, 1855, 2.79.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.	
			Course.	Strength.
1855.				
Nov. 4	12 noon	2. 60	East	Light breeze
5	do	2. 75	South	A gale
6	do	2. 40	West	Light breeze
7	do	2. 65	East	do
8	do	2. 45	Southwest	do
9	do	2. 50	Southeast	do
10	do	2. 42	Southwest	do
11	do	2. 60	East	do
12	do	2. 70	Northeast	Fresh breeze
13	do	2. 10	South	Light breeze
14	do	2. 70	do	do
15	do	3. 05	Southwest	Fresh breeze
16	do	3. 20	North	do
17	do	3. 20	do	do
18	do	2. 55	West	Light breeze
19	do	2. 50	Northeast	do
20	do	2. 40	South	Fresh breeze
21	do	3. 20	Northwest	Light breeze
22	do	2. 70	Southwest	do
23	do	1. 70	West	Fresh breeze
24	do	2. 35	South	Light breeze
25	do	2. 50	Southwest	do
26	do	2. 65	West	Fresh breeze
27	do	2. 00	do	do
28	do	2. 80	North	do
29	do	2. 50	Southeast	Light breeze
30	do	2. 25	South	Fresh breeze

NOTE.—Average height, as per tide-gauge, for November, 1855, 2. 59.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Weather.
			Course.	Strength.	
1855.					
Dec. 1	12 noon	1. 95	South	Fresh breeze	Pleasant; vessels coming in.
2	do	2. 50	West	do	do
3	do	2. 35	do	Light breeze	do
4	do	2. 30	South	do	do
5	do	2. 40	Southwest	do	do
6	do	2. 60	West	do	do
7	do	2. 50	Southeast	Fresh breeze	do
8	do	2. 80	South	do	Raining; heavy clouds from south.
9	do	4. 00	Northwest	Fresh; gale	Ten vessels outside of harbor; could not enter for bar.

A 31—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Weather.
			Course.	Strength.	
1855.					
Dec. 10	12 noon	3.50.....	Northwest..	Fresh breeze..	Fourteen vessels outside of harbor; could not enter for bar; lake rough.
11	do	2.80.....	South.....	Light breeze..	Seven vessels outside of harbor; could not enter for bar, though pleasant.
12	do	2.65.....	Southeast..	do	Vessels all brought in by tug-boat.
13	do	3.00.....	Northeast..	Fresh breeze..	Navigation nearly closed..
14	do	2.85.....	Southeast..	Gale, (a) ..	Two vessels outside of harbor; raining.
15	do	2.75.....	Southwest..	Light breeze..	Two vessels came in.....
16	do	2.60.....	West.....	do	Four vessels came in.....
17	do	2.25.....	do	do	Clear and cold; two vessels came in.
18	do	2.35.....	Southeast..	do	River frozen over.....
19	do	2.65.....	South.....	do	One vessel outside harbor; broke through ice by windlass and came into wharf.
20	do	2.25.....	do	do	River frozen over; clear..
21	do	2.85.....	West.....	do	Moderate and thawing....
22	do	3.00.....	Northeast..	do	Ice broken up; river open.
23	do	2.65.....	West.....	do	River frozen over; navigation closed.
24	do	2.75.....	Northwest..	do	Clear and cold.....
25	do	3.00.....	do	do	Ten degrees below zero by Fahrenheit; snowing.
26	do	Frozen..	Southwest..	Fresh breeze..	Snow six inches deep.....
27	do	do	do	Light breeze..	Very cold; lake calm....
28	do	do	North.....	Fresh breeze..	Snowing.....
29	do	do	East.....	do	Snow storm from east....
30	do	do	West.....	do	Clear and cold.....
31	do	do	South.....	Light breeze..	.....

NOTE.—Average height, as per tide-guage, for December, 1855, 25 days, 2.69.

*Recapitulation showing the average height of the surface of Lake Michigan at Chicago, as per reading of our tide-gauge, for each separate month, from September 1, 1854, to December 25, 1855.**

Year.	Month.	Average monthly height of lake surface, per tide-gauge, in feet and decimels.
1854-----	September -----	2. 79
	October -----	2. 22
	November -----	1. 95
	December 1 to 18, and 26 to 31-----	1. 87
1855-----	January 1 to 20-----	1. 61
	February ; tide-gauge frozen, and no observations-----	-----
	March 15 to 31-----	1. 65
	April-----	1. 73
	May-----	2. 40
	June-----	2. 63
	July-----	2. 72
	August-----	2. 83
	September-----	2. 92
	October-----	2. 79
	November-----	2. 59
	December 1 to 25-----	2. 69

A graphic profile of the surface of this lake, at Chicago, projected from the daily observations recorded in the foregoing tables, will be found among the maps and drawings forwarded in duplicate to the Topographical Engineer Department in illustration of this report.

This PROFILE embraces the whole period from the 1st of September, 1854, to December 25, 1855. It is marked "G No. 37."

In order to preserve permanent references to the horizontal plane corresponding to the zero (0) mark of the tide-gauge, offsets were made with an engineer's levelling instrument to the following named permanent objects, whose heights above the horizontal plane of that zero (0) mark were found to be as follows, viz:

1. The surface of the stone base, on which rest the stone pilasters of the stone masonry basement, at the northwest corner of the United States marine hospital, 12.83 feet.

2. The top of the stone coping, which rests on the tops of these pilasters, 19.33 feet.

3. The upper surface of the stone sills of the west basement windows of this hospital, 13.92 feet.

4. The top surface of the stone basement wall on which the iron railing rests, at the northwest angle of the hospital enclosure, 14.83 feet.

5. The top of the coping of the west extremity of the brick wall, which is the north side of the hospital enclosure, 20.33 feet.

J. D. GRAHAM,

Maj. Top'l Eng's, Brev. Lieut. Col., Sup'g Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

* After December 25 the tide-gauge and the lake surface were frozen, so that no observations could be made between that date and the end of December, 1855.

J. D. G.

A 31.—(*Chicago Harbor.*)

1. Average height of the surface of Lake Michigan, per tide-gauge, from September 1, 1854, to December 25, 1855, by giving weight according to the number of days' observations in each month, (see details in the preceding tables,) 2.4 feet.

2. The greatest height, per tide-gauge, during the above period, was, September 18, 1855, 4.3 feet.

3. The least height, per tide-gauge, during the above period was, January 6 and 14, 1855, 1.0 foot.

4. Extreme fluctuation in elevation of the surface of Lake Michigan between the 1st of September, 1854, and the 25th of December, 1855, 3.3 feet.

If the year 1855 be considered separately, the results will be as follows, viz:

1. Average height of the surface of Lake Michigan, per tide-gauge, from January 1, 1855, to December 25, 1855, after which last date the register could not be continued, because the gauge was frozen tight in its box, 2.47 feet.

2. The greatest height, per tide-gauge, during the above period was, September 18, 1855, 4.3 feet.

3. The least height, per tide-gauge, during the above period, was, January 6 and 14, 1855, 1.0 foot.

4. Extreme variation in the elevation of the surface of Lake Michigan during the year 1855, 3.3 feet.

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lt. Col., Sup. Eng.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

A 32.

*Colonel Graham's report on a new light-house for the port of Chicago, Illinois.**

[No. 30.]

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, July 30, 1854.

SIR: Soon after taking my station as superintending engineer of the harbor works upon this lake, in April last, my attention was given, in accordance with your instructions, to the subject of the proposed new light-house at the entrance of Chicago harbor.

* On the 26th of July, 1856, Colonel Graham made a further report, on the subject of this light-house, to the Light-house Board. The general plan recommended is the same as that contained herein. The foundation for the support of the superstructure was, however, modified by recommending oak piles instead of iron screw-piles. The keeper's dwelling was also recommended to be reduced in dimensions. The report, and its accompanying drawings, of July 26, 1856, were adopted by the Light-house Board, and is now being carried out. The position for the light is the same as herein recommended by Colonel Graham.

J. D. GRAHAM.

NOVEMBER 15, 1856.

In illustration of my views, in obedience to the directions contained in your letter of the 13th of May last, I have the honor to submit the accompanying drawings, viz :

G No. 5.—A plan of the north pier-head, showing the foundation heretofore proposed for supporting the new light-house. Also the plan of six cribs to serve as pier fenders, as proposed by myself in case the foundation on the north pier-head should be adopted. Scale $\frac{1}{48}$. (The duplicate now presented is on a scale of $\frac{1}{96}$.)

G No. 6.—A plan proposed for the new light-house and keeper's residence, each to be supported upon iron screw piles to be driven into the soil at the bottom of the lake, and protected by the cribs R, S, and T, as breakwaters. Also showing the depth of water in which these structures are to be placed, off the north pier-head, from soundings taken June 10, 1854. Scale $\frac{1}{96}$.

G No. 7.—A vertical section, at right angles to the meridian, showing the elevation of the proposed light-house and keeper's residence, and a communication between them by a lifting platform from the third story of the latter building. Scale $\frac{1}{96}$.

G No. 8.—Details showing, in horizontal projection, the interior arrangements of the keeper's dwelling-house. Scale $\frac{1}{96}$.

G No. 9.—A modification of the plan on sheet G No. 6, by placing the crib R in the prolongation of the face *d* of the pier-head, so as to coincide nearly with the direction of the lake current. Scale $\frac{1}{96}$.

The plan heretofore presented was to construct an iron pile light-house, of octagonal form, to rest upon the north pier-head, within the square or centre compartment A, (see the plan marked G No. 5,) thus giving it a base inscribed within a circle of 21 feet diameter.

This base is elevated above the mean level of the lake surface.....

8 feet.

The iron supports were to rise to a perpendicular height above their base, before receiving the platform supporting the lantern, of.....

60 “

Elevation of the focal plane above the platform.....

5½ “

Total elevation of the focal plane above the level of the lake surface, at its mean stage.....

73½ feet.

This elevation for the light we consider judicious. It is precisely what we would recommend. At this elevation the focal plane will be tangent to the lake surface at a distance of $11\frac{1}{2}$ miles from the piers or entrance of Chicago river. From the decks of vessels generally navigating this lake, the light would be visible at a distance of 15 miles, and from the upper rigging at a distance of from $18\frac{1}{2}$ to 22 miles, according to the class of the vessel.

The strength of the foundation, and its capability to sustain the vertical pressure of even a much greater weight than the superstructure proposed, cannot, I think, be questioned.

The full description of the pier of support, rendered to your office by my predecessor, will give full information upon this point. I will remark that, since my arrival here, in April last, I have several

times inspected it, and notwithstanding the violent gale that occurred in the latter part of that month, causing many wrecks, and the loss of many lives, this foundation stood immovable against the powerful action of the waves.

The judicious course adopted by Captain J. D. Webster, in protecting the exposed faces of the pier head from the undermining action of the current by sheath-piling driven to a depth of from 10 to 12 feet deep into the soil at the bottom of the lake, is, undoubtedly, the cause which has preserved the pier head from dipping to the northeast.

Having thus given you a description of the plan heretofore proposed, and of the elements of strength in the foundation, it now becomes my duty to submit, for consideration, several features in it which I consider as constituting insuperable objections to it as a whole. They are as follows, viz :

1. A base of 21 feet diameter, and a diameter of 12 feet for the deck or platform, at a height of 60 feet perpendicular above the base, gives for the slope or batter of iron tubes or rods sustaining the light a base of only $4\frac{1}{2}$ feet for 60 feet perpendicular, or in the proportion of only 1 base to 13 3 perpendicular. This appears to us much too steep a structure to resist the overturning effect of violent and continued gales from the northeast and east.

I do not think, that for any such structure, the batter should be steeper or incline nearer to the perpendicular than would be indicated by 1 base to 6 perpendicular. If this were adopted on a base of 21 feet and a platform of 12 feet diameter, the piles of support would rise only to a height, above the base of..... 27 feet.
 Height of base above the mean level of the lake surface... 8 "
 Elevation of the focal plane above the platform..... $5\frac{1}{2}$ "

Giving a total elevation for the focal plane above the mean level of the lake surface of only..... $40\frac{1}{2}$ feet.

This would cause the focal plane to be tangent to the lake surface, at a distance of $8\frac{4}{10}$ miles, and the light to be visible from the decks of ordinary vessels navigating the lake, at a distance of 12 miles from the entrance to the river ; and, from the upper rigging, at a distance of from $15\frac{2}{3}$ miles to 19 miles. These distances would appertain to perfectly clear weather, and are insufficient, considering that they would be much diminished in thick or foggy weather, when the aid of the light would be most needed.

2. The iron supports and bracing would, at the base, approach within $11\frac{1}{2}$ feet of the exteriors of six faces of the pier head, namely : *a, b, c, d, e, and f*. At a height of 60 feet above the water level, the exterior of these bracings and supports of the light would be within $15\frac{1}{2}$ feet of planes rising perpendicular from the outer facings of this pier head. Hence, the light-house would be constantly in imminent danger of being run into, or dragged down, by the yards and bowsprits of vessels entering and clearing the harbor ; a catastrophe which has happened more than once to the beacon light which now stands upon the pier head. This objection acquires additional force, when we reflect upon the great number of vessels which crowd into the entrance of this river on the approach of, or during a northerly or northeasterly

gale, at which times they all keep as close as possible to the north pier head, for fear of being carried by lee-way south of the entire entrance to the harbor. During the severe gale of April last several vessels were driven against the faces *d* and *e* of this pier head, with so much force that the strong timber work was made to yield by indentations, which are permanent, of as much as 10 to 15 inches in *d*, and 2 inches in *e*, within the original planes of these faces respectively. That is to say, these quantities represent the versed-sines of the curves which have been thus formed upon the original cords, of 18 feet and 3 inches in length. We should be loth to put so important a structure upon a foundation constantly liable to be thus battered, because, in time, it might become so much dilapidated as to cause the superstructure to fall.

There are vessels now in this port whose yards are of the following lengths and heights above the water level, viz:

	Length in feet.	Height above the water in feet.
Main yard.....	70	50
Topsail yard.....	50	76
Topgallant yard.....	35	94
Royal yard.....	30	108

I will remark, that vessels are more heavily sparred on our north-western lakes than those of like tonnage on the salt ocean.

The lantern of the light-house, upon the plan heretofore proposed, would be in danger, at any time, of being swept by the topsail yard of a vessel of the above mentioned class. In the spring of the year 1851, the beacon light upon the extremity of the north pier at Milwaukee was swept away by the yards of the brigantine Churubusco, and for several months afterwards navigators had nothing but a common glass globe lantern, put up temporarily, to guide them in entering the harbor.

3. An additional objection presents itself to our minds against placing a light-house upon a pier formation like this, composed of a frame work of wood, with stone thrown into the compartments, to take position, one upon another, according to their varied and irregular shapes. It is, that should even one or two of the timbers forming the frame work give way or be broken by the great pressure of the stone, filling the pier to a height of 20 to 25 feet where the water is so deep, that is, should the rupture take place far below the water level, where the pressure is greatest, the base upon which the structure immediately rests must also yield, and the superstructure be overthrown; or should anything occur to disturb a portion of the sheath-piling upon the faces exposed to the greatest action of the current, the pier head would be undermined and be made to dip or incline downwards, to the northeast, and the same fate to the superstructure would be produced.

It has been suggested that the rubble stone might be taken from the compartments B, C, D, E, &c., to L, or from such of them as might be requisite, in order to have iron screw-piles inserted within them and driven into the soil for the support of the light-house, and then to fill the compartments again with stone. It is found, however, in that case that the diameter of the base could not be less than

34 feet, in order that the iron piles should sufficiently clear the timbers of the frame work.

This would be a good dimension for the base of the structure, and would afford the desired elevation at the proper batter; but it would bring the iron rods of support and the bracings within 5 to 8 feet of the exterior timbers forming the faces of the pier-head, before mentioned, and thus subject the work to a still greater liability to be injured or overthrown by vessels thrusting their spars into it.

Moreover, it will be seen that no figure of regular form, except a hexagon, could be adopted as a base without interfering with the frame timbers before mentioned. It will be found, on trial, that neither a regular pentagon, heptagon, octagon, nonagon, nor decagon could be adopted free from this inconvenience. The least settling of the pier work would, if either of these figures of regular form were adopted, cause the timbers to impinge against the iron tubes or rods of support, and thus endanger their stability.

If, notwithstanding these remarks, it should be determined to erect the light-house upon this pier-head, I would recommend that the cribs marked Nos. 1, 2, 3, 4, 5, 6, and drawn in red on sheet G No. 5, be erected as fenders to protect the light from collision with the spars of vessels.

These cribs, to be 20 feet wide by a total length of 190 feet, and to rise to a height of 8 feet above the mean level of the lake surface, would cost (see estimate No. 1, hereto appended) the sum of \$16,035 95.

The above sum of \$16,035 95 appears, then, to be necessary as an additional expenditure on account of the foundation, should the light-house be placed upon the north pier-head.

I will now respectfully ask your consideration of the following plan, which I propose as a substitute for the whole work, and, in explanation, I refer to the accompanying drawings, marked G No. 6 and G No. 7:

It is, to construct the piers or cribs R, S, T, (sheet G No. 6,) so as to form, with the present north pier, an inclosure, having an interior area of eighty-five by fifty-five feet, and within this to erect both the light-house and keeper's house, the one detached from the other—the light-house to be an iron structure similar to that heretofore proposed, except that its octagonal base will be inscribed within a circle of thirty-three feet diameter, and will rise, in the form of a right prism, to a height of five feet above the level of the high-water surface of the lake; thence in the form of a truncated pyramid to an additional height of (measured perpendicularly) fifty-seven feet, upon a batter, or slope, of six perpendicular to one base. This will bring the centres of the tubes or rods of support to coincide with the circumference of a circle of fourteen feet diameter. An additional height of eleven feet, to the focal plane, gives, for the elevation of this plane above the high-water level of the lake, seventy-three feet.

The pier R runs perpendicular to the face *e* of the north pier-head, or, in a direction *north*, by compass.

It is fifty-four feet long by twenty feet wide; it will be placed in an average depth of twenty-two feet water, and will rise to a height of _f

eight feet above the mean level of the lake surface, or five feet above its present surface. This will make the average height of this pier twenty-seven feet from top to bottom.

The pier S will butt against the end of R, and will run at right angles to it, ninety-five feet west by twenty feet wide. It will be in an average depth of twelve feet water, and will be on the same level at top with R; hence its average height from top to bottom will be seventeen feet.

At right angles to S, and also to the north pier, is the crib T, fifty-five feet long by ten feet wide, which completes the inclosure. It rises to the same level at top with R and S, from an average depth of eighteen feet water; consequently its average height from top to bottom will be twenty-three feet. A width of ten feet is considered quite enough for this crib T, because, although in deep water, it will have but little force to resist, being protected from the action of the waves by R and S. Even a less width than ten feet might suffice, but for the difficulty in sinking, accurately, a crib with less base in that depth of water.

The estimate hereto appended computes the cost of these three cribs R, S, and T, to be \$10,635 39, being less than the amount required to construct the six cribs of defence as shown on the plan G No. 5, by the sum of \$5,400 56.

Both estimates are based upon the same data as to prices of materials and durability of construction.

The superstructure of the light-house will rest upon nine iron piles, which it is proposed to have nine inches in diameter, cylindrical in form, and thirty-seven feet long. Eight of these piles will be placed equidistant upon the circumference of a circle of thirty-three feet diameter, thus forming, in figure, a regular octagonal prism, each side of which will, in projection upon its base, be 12.61 feet long—that is to say, this will be the length of the horizontal girders connecting the consecutive piles together, from centre to centre, at their tops.

The ninth pile will occupy the centre of the prison formed by the other eight. These piles will be erected in water of an average depth of 25 feet. They will be screwed into the soil at the bottom of the lake, penetrating it to a depth of about 7 feet, and their tops will rise 5 feet above the present level of the lake surface. At a convenient time, in course of the construction, the whole enclosure formed by these three piers of defence, united with the north pier of the channel, will be filled up with earth taken from the bottom of the river and lake. This will require 3,547 cubic yards to bring the filling to a level with the lake surface, which quantity the steam dredge now in use here would supply in 6 working days or less.

The nine piles of support would be so arranged that four sides of the octagon would be parallel with, and 13 feet distant from, the interior sides of the nearest pier of defence, or 33 feet distant from the exterior sides of the piers R and S, and 37 feet* from the exterior or river-face of the north pier of the channel; so that no spar of any

*The width of the north pier of the channel-way is 24 feet just before it meets the pier-head.

vessel could ever reach any portion of the structure. By this arrangement, too, the light-house would always be free from any shock or disturbance which might be communicated to the piers of defence. The battering of vessels against these piers, or even the tilting of the piers themselves from any undermining effect of the current along the lake shore, would not in anywise disturb the stability of the light-house under this plan.

The same security would be afforded to the keeper's dwelling, which it is proposed to build of brick on a base of 37 feet long by 25 feet 4 inches wide, to be supported by 12 iron piles, each 27 feet long and 9 inches in diameter, of cylindrical form, to be screwed into the soil at the bottom of the water; their tops to be depressed $4\frac{1}{2}$ feet below the level of the lake surface, and there to be tied together by iron girders, which in turn are to support a flooring of oak timbers 37 feet long, 12 by 12 inches, laid close together; and these to be planked over with 3-inch oak plank, the upper surface of which would be 1 foot 4 inches below the water surface. From this plank flooring would rise the main and partition brick walls of the building; the portion below the water level to be laid in hydraulic cement. For illustration, see the vertical section represented on sheet G No. 7, in connexion with the ground plan on sheet G No. 6. The south wall of this building would be 34 feet from the south or river-face of the north pier, and out of the reach of the spars of all vessels. It would be 10 feet from the north wall of the same pier, with which it would communicate by a lifting platform* 4 feet 8 inches wide on a level with the basement floor.

Its east wall would be from 7 to 10 feet, as might be preferred, distant to the west from the base of the light-house, and the communication between them would be also by a lifting platform* extending from the level of the flooring of the third story of the dwelling to the lower balcony of the light-house.

On the same level would begin the lower part of the stairway of the light-house, extending thence up to the watch-tower and lantern.

This proximity of the dwelling to the light-house would appear to be important, in order that the keeper might always at night be near by and ready to render any service which exigency might require. It also appears important that every light-house keeper should have a comfortable residence near to his post of duty, where the lives of mariners and the safety of property afloat requires that he should habitually be on the alert.

In order to render the basement of this building at all times dry, a condition necessary to health, it is proposed to fill up the spaces between the brick walls (which rest upon the oak flooring under the water,) to a height of four feet above the level of the lake surface with rubble stone laid in hydraulic cement, as is represented in the drawing. Stratified limestone, giving flat and safe bearings, can be obtained here suitable for this purpose at \$4 per cord of 128 cubic feet, delivered where required for use. Hydraulic lime, of excellent quality, will cost 60 cents per bushel, delivered in like manner.

*These lifting platforms are necessary here, in order to cut off communication and prevent the constant intrusion of idle people, who come in crowds to fish on the pier head.

An estimate of the cost of this building, of the dimensions represented in the drawings, is appended, marked No. 3, amounting to the sum of \$8,311 33, that is to say, eight thousand three hundred and eleven dollars and thirty-three cents.

It is proposed to have the main walls one foot thick, and the partition wall, dividing the enclosed space into rooms, eight inches thick.

The passage way running the whole length of the building is six feet wide, which allows ample room for the stairway and for convenience in passing. The rooms are 17 feet 2 inches by 16 feet 4 inches. They, together with the arrangement of chimneys, fire places, storerooms, closets, &c., are shown in detail on sheet G No. 8, on a scale of $\frac{1}{8}$ or 8 feet to 1 inch.

It is proposed to divide the inclined iron piles, which rest upon the prism below, into three sections, to constitute 24 piles, each 19.26 feet long. The corresponding three centre piles would be each 19 feet long. The diameter of the lower ends of the piles forming the first of these three sections to be 9 inches, and to have a uniform taper throughout the three sections, such that the diameter at the top, where the supports of the platform are received, shall be 6 inches.

The girding and the bracing, and the mode of connecting the joints to be of the form that shall be approved, when time can be allowed for presenting these minor details. Those which would be in the plane of the vertical section, alone, appear in the drawing of that section.

It is proposed that a segment of 90 degrees of the cylinder forming the watch tower shall be of glass plates, 12 by 16 inches, in strong iron sashes, and guarded by a net work of iron wire and that a sufficient portion of the platform and flooring shall be latticed, and a certain portion of the prismatic lenses of the lantern so arranged as to throw a sufficient volume of light down upon the pier head, and also upon the pier R, to illuminate them sufficiently to enable vessels to clear them, and to serve as guides at night in entering the mouth of this narrow river.

The structure will thus serve the double purpose of a light-house and harbor beacon.

I would recommend, in aid of this, that a lenticular apparatus of the second order be chosen. The increased difficulty in entering these lake harbors with safety, at night, from their being unavoidably so narrow, would seem to constitute a fair claim to this consideration in their favor.

The population of Chicago has now mounted up to 73,000 inhabitants, and its commerce is increasing in an almost unprecedented ratio, and demands justly all the aids which can be devised, in the way of accommodations, to facilitate ingress and egress to and from its harbor, in order to prevent this commerce from being seriously clogged.

Its foreign trade already contributes a handsome revenue to the general treasury, and nothing is now so much needed, in order to keep pace with its commercial enterprise, as the completion of its harbor improvement, and the erection of an efficient and reliable light-house. The number of arrivals and departures of vessels of all

classes amounts to a daily average of forty during the season of navigation.

The following abstract from the books of the custom-house here, kindly furnished, on my application, by William B. Snowbrook, esq., collector for this port, shows that the duties on foreign imports for the fiscal year ending June 30, 1854, collected here, amounts to the sum of \$334,043 98, viz: For the month of—

July, 1853.....	\$18,619 55
August.....	42,979 58
September.....	38,188 37
October.....	24,437 66
November.....	46,741 25
December.....	29,159 25
January, 1854.....	9,042 07
February.....	7,001 44
March.....	20,511 73
April.....	24,590 04
May.....	32,504 13
June.....	40,368 61
Total for the year ending June 30, 1854.....	<u>334,043 98</u>

For the present month of July, 1854, the receipts will amount to about \$50,000. The receipts are accumulating in an increasing ratio, and will amount to much more in the next fiscal year than during the last.

It will be seen by the above exhibit, and the estimates submitted, that two months average revenue from custom duties will cover all the expenses of constructing the new light-house and all its appurtenances, including a convenient and substantial residence for the keeper, in a manner to render them all of the most efficient and durable character.

The present light-house stands upon the south bank of Chicago river, near old Fort Dearborn. It is supplied with five parabolic reflectors. The focal plane is at an elevation of sixty-one feet above the mean level of the lake surface. The city has now grown up around it to such an extent that the light is eclipsed from the view of vessels upon the lake throughout the following segments of the horizon, viz:

From north 14° west to north 24° west, $= 10^{\circ}$ by trees and buildings within the city.

From north 4° east to north 10° east, by the Lake-house Hotel and trees near it, $= 6^{\circ}$.

From north 18° east to north 29° east, $= 11^{\circ}$, by trees on the north side of the river.

From east to south 60° east, $= 30^{\circ}$ by the new marine hospital and trees near it.

From south 43° east to south 26° east, $= 17^{\circ}$ by houses in the city.

From south 24° east, to the bearing of the extreme indentation of the lake, say to south 17° east, by trees and buildings, $= 7^{\circ}$.

From the above observations, carefully made with the compass, it will be seen that a segment of 177° of the horizon is required to be illuminated by the light-house, but that 81° of this segment are eclipsed from the benefit of the light by objects which did not exist when the light-house was built: but which have since grown up with the improvements within the city.

The proposed position for the new light will be free from all liability to such obstructions.

Gas being now used throughout this city, it will be easy to introduce it for use in the new light-house, and the expense is included in the estimate for laying the necessary pipes, and all the appurtenances for lighting the keeper's house and the light-house with gas.

The experiments, as far as I have been able to make them up to this time, upon the direction and force of the predominating lake current, as it passes the present north pier-head, induce me to recommend that the form shown upon sheet G No. 9 be adopted for the cribs of defence, subject, however, to such slight variation of position as further experiments may suggest for approval.

Here the crib R is placed upon a northwest course, its outward face being upon a prolongation of the face *d*, of the north pier-head. It is thus brought in coincidence, or nearly so, with the direction of the current. Instead, therefore, of arresting the velocity of the current, it will rather tend, by the impact of the water, to increase it, and to sweep the silt past a certain space of the channel way. I believe, under any system that can possibly be devised, partial dredging will be necessary every season to keep down the bars which an immutable law of nature will be constantly tending to form at all the harbor entrances on this lake. When once these bars are cut down it will be easy, in this way, to keep them subdued; and I would earnestly recommend that two more steam dredges, similar (with some slight modifications hereafter to be suggested) to the one now in use here, be allowed for this purpose. I think it the cheapest, most efficient, and most safe plan, that can be united with the general system of pier work now in vogue. Views more in detail will be presented hereafter upon the facts which appear to me to lead to this conclusion.

The quantity of materials, and amount of labor, and the average depth of water to be encountered, in forming the cribs of defence in accordance either with the plan shown on sheet G No. 6, or with that on G No. 9, will be about the same. Estimate No. 2 will apply, therefore, to either. Any difference in cost will be rather in favor of the plan on sheet G No. 9.

The soil on the lake bottom here is peculiarly adapted to screw piles of iron, as a base of support, being fine sand for a few feet in depth, overlaying stiff clay.

This system for light-houses, and for protecting them from the action of the lake waves, I think equally applicable to the harbors generally in this lake, when new ones may be required.

Estimate No. 4, attached hereto, is for the expense of erecting the light-house for Chicago harbor, and all contingent expenses, exclusive of the cribs of defence, R, S, T, and the keeper's house.

It amounts to.....	\$40,317 00
Cribs of defence, R, S, T.....	10,635 39
Keeper's house.....	8,311 33
Total:.....	59,263 72
Balance of former appropriation.....	12,331 05
Additional amount required.....	46,932 67

I think the present north pier-head structure a judicious termination of that pier, for reasons peculiar to Chicago harbor, but which might not apply to the harbors on this lake generally. The extensive commerce of this city causes crowds of vessels to be often entering its harbor. In a northerly or northeasterly wind they must, for the reason hereinbefore stated, double the north pier-head as close as possible. This will always render it liable to be battered, occasionally, by the lake craft, with much force. A terminating crib of the ordinary form and dimensions would often have its timbers above water carried away, a thing which has already happened to the terminating crib of the south pier, which is far less liable to such accidents than the other. Much additional strength seems, then, necessary at the termination of the north pier; and it appears, from observation, so far, that it could not have been better planned than it is for this object.

All which is respectfully submitted.

J. D. GRAHAM,

Major Top'l Engineers, Bvt. Lieut. Col., Sup'g Eng'r, &c.

Colonel J. J. ABERT,

Chief Topographical Engineers.

No. 1

Estimate of the cost of constructing the cribs Nos. 1, 2, 3, 4, 5, and 6, necessary as pier fenders in case the north pier-head should be adopted as the foundation for the light-house. (See sheet G, No. 5.)

Items.	Materials required.	Crib No. 1.	Crib No. 2.	Crib No. 3.	Crib No. 4.	Crib No. 5.	Crib No. 6.	Total.
<i>Timber.</i>								
1	For sides and middle stringers, cubic feet of.....	4,536	2,106	2,106	2,106	2,106	3,483	16,443
2	For end walls and cross-ties, cubic feet of.....	3,294	2,214	2,214	2,214	2,214	2,376	14,526
3	Grillage for bottoms, cubic feet of.....	504	224	224	224	224	412	1,812
4	Outside piles, (three to each crib,) cubic feet of.....	120	120	120	120	120	120	720
5	Upper platform, longitudinal sleepers, cubic feet of.....	112	52	52	52	52	86	496
6	Sheath piling of oak, three inches thick, feet, board measure.....			5,400	5,400	5,400	5,400	21,600
7	Plank flooring of oak three inches thick, the planks to be placed two inches apart.....	2,565	1,197	1,197	1,197	1,197	1,995	9,348
<i>Iron bolts and spikes, &c.</i>								
8	Bolt iron, 1 by 1 inch, and 18 inches long for each bolt, weight 3.38 lbs. per foot, lbs. of.....	2,772	2,241	2,241	2,241	2,241	2,373	14,109
9	Bolt iron to fasten sleepers to the upper cross ties, lbs. of.....	75	54	54	54	54	65	356
10	Spikes for flooring, 6 inches long, and $\frac{3}{8}$ by $\frac{3}{8}$ inch, weighing five to the pound, lbs. of.....	126	59	59	59	59	98	460
11	Spikes for fastening tops of sheath piles, 9 inches long, $\frac{3}{8}$ by $\frac{3}{8}$ inch, weighing each 0.356 of a pound, lbs. of.....			38	38	38	43	157
12	Stone for filling cribs to the water level, cords of.....	216	60	60	60	60	108	564

Cost of materials under the head of "Totals" from the foregoing exhibit; also of workmanship.

32,781 cubic feet of oak, 12 by 12 inches for sides, middle stringers, cross-ties and grillage at bottom of cribs, (items 1, 2, 3,) at 16 cents.....	\$5,244 96
720 cubic feet of outside piles, (item 4,) at 16 cents.....	115 20
406 cubic feet longitudinal sleepers, 6 by 12 inches, at 16 cents.....	64 96
30,948 feet, board measure, for sheath-piling and flooring, (items 6 and 7,) at \$20 per thousand.....	618 96
14,465 lbs. bolt iron, 1 by 1 inch square, (items 8 and 9,) at 5 cents.....	723 25
460 lbs. 6-inch spikes for floors, (item 10,) at 8 cents.....	36 80
157 lbs. 9-inch spikes for fastening sheath-piling to sides of cribs, (item 11,) at 7 cents.....	10 99
564 cords of stone, (item 12,) at \$4.....	2,256 00
Estimated cost of materials for 6 cribs.....	9,071 12
For workmanship, framing, sinking cribs in position, driving piles, and superintendence, clerk hire, &c., for 6 cribs.....	4,875 00
	13,946 12
Add for contingencies 10 per cent.....	1,394 61
Estimated cost of 6 cribs for pier fenders.....	15,340 73

No. 2.

Estimate of the cost of constructing the piers of defence R, S, and T, (see drawings G Nos. 6 and 9,) for the protection of the iron screw pile light-house for Chicago harbor.

Items.	Materials required.	Crib R.	Crib S.	Crib T.	Totals.
<i>Timber.</i>					
1	For sides and middle stringers, cubic feet of-----	4,374	4,896	2,530	11,800
2	For end walls and cross-ties, cubic feet of, including grillage for bottom of cribs-----	3,420	3,240	1,280	7,940
3	Outside piles, (6 to each crib,) to aid in their alignment, cubic feet of-----	240	360	210	810
4	Sheath piling, as protection from undermining of the current, feet, board measure, of oak 4 inches thick-----	8,880	2,400	-----	11,280
5	Upper platform longitudinal sleepers, to support flooring, to be 6 by 12 inches, cubic feet of-----	108	192	82½	382½
6	Plank flooring of oak, 3 inches thick, to be 2 inches apart, feet, board measure-----	2,400	4,200	1,200	7,800
<i>Iron bolts and spikes.</i>					
7	Bolt iron, 1 by 1-inch, square in form, each bolt to be 18 inches long, weighing 3.38 pounds per foot, or 5.07 pounds per bolt, pounds of-----	3,164	2,110	1,561	6,835
8	Spikes for fastening tops of sheath piling to the cribs, each spike 9 inches long, and ¾ by ¾-inch, weighing each .356 of a pound, or 35.6 pounds per 100, pounds of-----	400	200	-----	600
9	Spikes to fasten the flooring to the sleepers, each 6 inches long, and ¾ by ¾-inch, weighing 5 to the pound, or 20 pounds per 100, pounds of-----	200	300	120	620
10	Stone for filling cribs to the water level, cords of-----	147	150	57	354

Cost of materials under the head of "Totals," from the foregoing exhibit, and of workmanship.

20,932½ cubic feet of white oak, squared, 12 by 12 inches, for sides, middle stringers, cross-ties, and outside piles, as per items 1, 2, 3, and 5, at 16 cents per cubic foot-----	\$3,349 20
19,080 feet, board measure, for sheath piling and flooring, as per items 4 and 6, at \$20 per M-----	381 60
6,835 pounds of bolt iron, square, 1 by 1-inch, as per item 7, at 5 cents per pound-----	341 75
600 pounds of 9-inch spikes, for fastening sheath piling, (item 8,) at 7 cents per pound-----	42 00
620 pounds of 6-inch spikes, for flooring, (item 9,) at 8 cents-----	49 60
354 cords of stone, (item 10,) at \$4-----	1,416 00
Estimated cost of materials-----	5,580 15
Workmanship in framing complete, sinking in position, driving piles, superintendence, &c.—R, \$1,350; S, \$1,900; T, \$825-----	4,075 00
	9,655 15
Add 10 per cent. for contingencies-----	965 51
Estimated cost of cribs R, S, and T, (sheets G 6 and 9)-----	10,620 66

No. 3.

Estimate of cost of keeper's residence. (See drawings G Nos. 6, 7, and 8.)

12 iron screw piles, with girder braces, and inserting and adjusting them in position, and building foundation, as per drawings	\$2,627 00
26,000 bricks laid in hydraulic cement, at \$16	416 00
152,000 bricks laid in quick lime mortar, at \$14	2,128 00
1,250 yards of three-coat plaster, at 32 cents	400 00
Cut stone caps and sills	160 00
Iron anchors and straps	20 00
7 iron mantles, at \$30	210 00
1,015 square feet of copper roof, (16 oz. per foot,) at 33 cents	334 95
Gutters and spouts	49 75
10,125 feet of joist and scantling, at \$17 per M	172 13
6,000 feet of narrow flooring, at \$26 per M	156 00
34 windows, with blinds, at \$14 each	476 00
21 doors complete, at \$11 each	231 00
Nails, hinges, bolts, and other hardware	150 00
Painting and glazing, with good glass	180 00
Carpenters' and joiners' work, and lumber	550 00
Cartage of materials	50 50
	8,311 33

No. 4.

Estimate of cost of iron screw pile light-house, of dimensions shown in the drawings. (Sheets G Nos. 6 and 7.)

1. Materials and workmanship of foundation and three other sections, and putting in position, including water-house, lantern, and dome	\$19,342 00
2. Expense of putting up and taking down at foundry, to adjust and test the fitting of all the parts, including the pay of three machinists and assistants, blacksmiths, laborers, and carpenters for erecting scaffolds ..	2,350 00
3. Timber and lumber for scaffolds and cartage	230 00
4. 1 derrick, complete, for hoisting	500 00
5. Rope and tackle	300 00
6. Tools, such as drills, dies, screw-plates, clamps, chisels, hammers, axes, &c. ..	650 00
7. Pay of agent at foundry, 260 days, at \$3 50	910 00
8. Cost of working mode in iron, complete	550 00
9. Cost of patterns for castings of all kinds	500 00
10. Cost of books on construction, drawing paper, and implements, and stationery	525 00
11. Pay of draughtsmen and clerks in office of superintending engineer	2,875 00
12. Pay of one assistant engineer	1,500 00
Fuel for office room one year	175 00
Pay of an office messenger and attendant	365 00
Transportation of superintending engineer, visiting the foundry, when necessary, to inspect and give directions in regard to the work, including extra personal expenses	1,260 00
House rent and fuel for same at Chicago one year	1,000 00
For an illuminating apparatus, lenticular of the second order	6,000 00
Transportation of same, and expenses of putting up and adjusting	525 00
Cost of laying gas pipes and gas fixtures for illumination of lantern	750 00
	40,307 00

No. 5.

Recapitulation showing the estimated cost of the iron screw pile light-house for Chicago harbor, with keeper's dwelling, three additional cribs as piers of defence, laying gas pipes and gas fixtures, a lenticular apparatus of the second order, models of construction, pay of assistants, transportation, expenses, and fuel and quarters of superintending engineer, and all contingencies.

Erecting three cribs as piers of defence, R, S, T, (see sheets G Nos. 6 and 9,) as per estimate No. 2	\$10,620 66
Erecting keeper's residence within the piers of defence, (sheets 6, 7, 8, 9,) estimate No. 3	8,311 33
Erecting light-house, with all appurtenances, (sheets G 7 and 9,) estimate No. 4, including all contingent expenses.....	40,307 00
	59,238 99
Balance of former appropriation available.....	12,331 05
Amount of appropriation required	46,907 94

J. D. GRAHAM,

Major Top. Eng'rs, Brevet Lieut. Col., Supterint'g Eng'r Lake Michigan Works.

OFFICE OF GENERAL SUPERINTENDENCE, &c.,

Chicago, July 30, 1854.

A 33.

Statement of the amount of duties collected at the port of Chicago of foreign merchandise from January 1, 1855, to December 31, 1855; showing also the enrolled tonnage of the district of Chicago, December 31, 1855, as appears from the records of the custom-house, Chicago; and showing also the number of arrivals and departures at the port of Chicago from March 1, 1855, to December 31, 1855.

Amount of duties received each month from January 1, 1855, to December 31, 1855.		Enrolled tonnage, December 31, 1855.	No, of barques enrolled.	No. of brigs enrolled.	No. of schooners enrolled.	No. of steamers enrolled.	No. of sloops, &c., enrolled.	No. of arrivals at and departures from the port of Chicago from March 1, 1855, to December 31, 1855.	Tonnage of vessels arriving and departing in said period.	Average number of daily arrivals and departures in said period.	Average am't of tonnage arriving and departing in said period, daily.
		Tons. 95ths.									
January.....	\$26,460 19	58,134 38	7	38	226	20	30	12,542	2,426,172	41	7,954
February.....	9,099 90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March.....	4,972 30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April.....	40,212 17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May.....	33,036 15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June.....	17,358 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July.....	51,051 80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
August.....	21,301 60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
September.....	25,830 40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
October.....	22,017 40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
November.....	27,400 15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December.....	16,207 85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	294,948 01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

NOTES.

Enrolled tonnage on December 31, 1855.....	Tons. 58,134 38
Enrolled tonnage on April 1, 1853.....	26,290 13
Increase in 2 years and 8 months.....	32,844 25

Although the amount of duties collected in 1855 is not quite as large as in 1854, when a large amount was collected on railway iron, the importing business, however, is at present in a more healthy condition, the number of imports having increased, and the imports being more varied.
I hereby certify as to the correctness of the above statements.

PHILIP CONLY,
Collector of the district of Chicago.

Submitted with my annual report (No. 116) for the year 1855.

J. D. GRAHAM,
Brevet Lieutenant Colonel, &c., &c., &c.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, December 31, 1855.

A 34.

Statement of the quantity and value of articles of merchandise received at the port of Chicago, by lake shipments, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels..	54,589	\$3 00	\$163,767 00
Apples, dried ----- bushels..	44,712	1 50	67,068 00
Ashes, pot ----- tons..	109	100 00	10,900 00
Barley ----- bushels..	56,736	1 00	56,736 00
Bark ----- cords..	4,471	8 00	35,768 00
Beans ----- bushels..	1,268	2 00	2,536 00
Bedsteads ----- number..	9,983	5 00	49,915 00
Beef ----- barrels..	90	13 00	1,170 00
Beer ----- do..	21,983	10 00	219,830 00
Boilers, steam ----- number..	95	1,500 00	142,500 00
Brandy ----- casks..	244	400 00	97,600 00
Bricks ----- M..	7,774 7-10	7 00	54,422 90
Brooms ----- dozen..	137,986	2 00	275,972 00
Buggies and wagons ----- number..	162	100 00	16,200 00
Butter ----- pounds..	34,510	15	5,176 00
Car axles ----- tons..	1,465	90 00	131,850 00
Car wheels ----- do..	2,375	75 00	178,125 00
Castings ----- do..	433	100 00	43,300 00
Cattle ----- number..	190	5 00	950 00
Champagne ----- baskets..	975	12 00	11,700 00
Cheese ----- casks..	2,953	30 00	88,590 00
Chair stuff ----- bundles..	1,260	2 00	2,520 00
Cider ----- barrels..	11,801	7 57	89,440 00
Coal ----- tons..	109,737	7 50	823,027 50
Codfish ----- hogsheads..	474	75 00	35,550 00
Coffee ----- sacks..	121,163	12 00	1,453,956 00
Cranberries ----- barrels..	870	10 00	8,700 00
Empty barrels ----- number..	19,816	1 00	19,816 00
Fire brick ----- do..	46,250	20	9,250 00
Fish ----- barrels..	26,113	9 00	235,017 00
Flour ----- do..	5,543	8 50	47,115 50
Gas pipe ----- tons..	1,730	45 00	77,850 00
Glass ----- boxes..	74,231	10 00	742,310 00
Grindstones ----- tons..	1,247	40 00	49,880 00
Hams ----- barrels..	270	20 00	5,400 00
High wines ----- do..	352	13 16	4,632 00
Hides ----- number..	11,344	4 00	45,376 00
Horses ----- do..	842	150 00	126,300 00
Laths ----- M..	54,615	2 50	136,537 50
Lard ----- pounds..	9,000	10	900 00
Lime ----- barrels..	8,438	1 50	12,657 00
Iron, railroad ----- tons..	28,736	75 00	2,155,200 00
Iron railroad chairs ----- number..	7,000	20 00	1,400 00
Iron, common ----- tons..	19,594	60 00	1,175,640 00
Iron, pig ----- do..	33,144	45 00	1,491,480 00
Iron ----- bars..	22,524	1 20	27,028 80
Iron ----- bundles..	3,633	3 50	12,715 50
Lumber, oak ----- M feet..	2,195	20 00	43,900 00
Lumber, pine ----- do..	327,891	15 00	4,918,365 00
Marble ----- tons..	1,708	55 00	93,940 00
Meal ----- barrels..	403	7 00	2,821 00
Merchandise ----- tons..	136,858	400 00	54,743,200 00
Merchandise ----- packages..	2,564,129	7 50	19,230,967 50
Mowing machines ----- number..	335	-----	35,000 00
Molasses ----- gallons..	1,164,193	50	582,096 50
Nails ----- kegs..	60,730	5 00	303,650 00

A 34—Continued.

Articles.	Quantity.	Price of each.	Value.
Oil ----- barrels--	2, 276	\$43 50	\$99, 006 00
Pails ----- dozen--	87, 220	2 00	174, 440 00
Peaches, dried ----- bushels--	13, 225	1 50	19, 837 50
Peas ----- do--	300	2 00	600 00
Pickets ----- M--	245	20 00	4, 900 00
Plaster ----- barrels--	6, 285	3 00	18, 755 00
Pork ----- do--	846	15 00	12, 690 00
Posts ----- number--	1, 512, 646	12	181, 517 52
Potatoes ----- bushels--	55, 197	1 00	55, 197 00
Porter ----- barrels--	961	20 00	19, 220 00
Rags ----- tons--	18	45 00	810 00
Rakes ----- dozen--	5, 251	3 00	15, 753 00
Reapers ----- number--	106	150 00	15, 900 00
Rosin ----- barrels--	1, 189	5 00	5, 945 00
Salæratius ----- boxes--	9, 537	8 00	76, 296 00
Salt ----- bags--	1, 081, 481	12	129, 777 72
Salt ----- barrels--	211, 656	2 00	423, 312 00
Seeds ----- bushels--	634	2 25	1, 426 50
Shingles ----- M--	110, 128 $\frac{7}{8}$	8 00	881, 031 11
Shingle bolts ----- cords--	4, 693	12 00	56, 316 00
Soap ----- boxes--	10, 134	5 00	50, 670 00
Spikes ----- kegs--	17, 327	7 00	121, 289 00
Spokes ----- M--	1, 090	15 00	16, 350 00
Slate ----- tons--	180	22 50	4, 050 00
Starch ----- boxes--	15, 973	4 00	63, 892 00
Staves and headings ----- M--	3, 941 $\frac{3}{4}$	16 00	63, 069 80
Steam engines ----- number--	10	1, 000 00	10, 000 00
Stone ----- cords--	677	10 00	6, 770 00
Stoneware ----- gallons--	431, 257	10	43, 125 70
Stoves ----- number--	547, 412	8 00	4, 379, 296 00
Sugar ----- pounds--	9, 757, 166	6	585, 429 96
Tallow ----- barrels--	285	24 00	6, 840 00
Tar ----- do--	211	5 00	1, 055 00
Telegraph poles ----- number--	4, 200	1 00	4, 200 00
Threshing machines ----- do--	140	100 00	14, 000 00
Ties, railroad ----- do--	49, 481	35	17, 318 35
Timber, pine ----- M feet--	7, 791	15 00	116, 865 00
Timber, oak ----- do--	1, 984	20 00	39, 680 00
Tobacco ----- hogsheads--	1, 493	76 55	114, 300 00
Trees ----- bundles--	5, 334	20 00	106, 680 00
Tubs ----- dozen--	18, 387	6 00	110, 322 00
Turpentine ----- barrels--	394	28 00	11, 032 00
Vinegar ----- do--	1, 718	00	8, 590 00
Wagon hubs ----- number--	2, 604	25	651 00
Washboards ----- dozen--	1, 617	3 00	4, 851 00
Wheat ----- bushels--	537, 983	1 50	806, 974 50
White lead ----- tons--	5, 691	200 00	1, 138, 200 00
Wine ----- casks--	192	40 00	7, 680 00
Wood ----- cords--	43, 636	6 00	261, 816 00
Wool ----- pounds--	16, 183	35	5, 664 05
Total value of receipts by lake ship- ments in 1855 -----			100, 752, 304 41

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

A 35.

Statement of the quantity and value of articles of merchandise received at the port of Chicago by the Illinois and Michigan canal during the year 1855.

Articles.	Quantity.	Price of each.	Value.
Ashes, pot.....tons	100	\$100 00	\$10,000 00
Beef.....barrels	33	13 00	429 00
Beer.....do	5	10 00	50 00
Barley.....bushels	204	1 00	204 00
Butter.....pounds	114,320	16	18,291 20
Beeswax.....do	80	37½	30 00
Bacon.....do	170,565	10	17,056 50
Buckwheat flour.....barrels	1,440	3 00	4,320 00
Broom corn.....bales	27,594	2 00	55,188 00
Bran and shorts.....tons	495	50 00	24,750 00
Bricks.....M	1,560	7 50	11,700 00
Cider.....barrels	6	8 00	48 00
Corn.....bushels	3,712,098	65	2,412,286 70
Coffee.....pounds	173,055	12	20,766 60
Cheese.....do	2,126	10	212 60
Candles.....do	50,060	11	5,506 60
Coal.....tons	5,050	6 00	30,300 00
Eggs.....dozens	5,005	10	500 50
Empty barrels.....number	3,918	1 00	3,918 00
Feathers.....pounds	7,529	50	3,764 50
Flour.....barrels	13,313	8 50	113,180 50
Grease.....pounds	66,977	10	6,697 70
Hides.....number	16,183	4 00	64,732 00
Hams.....pounds	1,505,643	12	180,677 16
Hops.....do	3,958	20	791 60
Hemp.....tons	28	100 00	2,800 00
Hoops.....M	1,762	13 00	22,906 00
Horses.....number	400	150 00	6,000 00
High wines.....gallons	3,859	40	1,543 60
Iron.....tons	5,944	60 00	356,640 00
Iron, pig.....do	2,395	45 00	107,775 00
Lard.....barrels	2,178	20 00	43,560 00
Merchandise.....tons	2,395	330 00	838,250 00
Meal.....barrels	2,286	7 00	16,002 00
Molasses.....gallons	549,983	50	274,992 50
Oats.....bushels	1,021,846	30	306,553 80
Provisions.....barrels	2,084	15 00	31,260 00
Rags.....tons	245	45 00	11,025 00
Rice.....barrels	503	12 50	6,287 50
Seeds.....bushels	5,089	2 25	11,450 25
Staves and headings.....M	450	16 00	7,200 00
Sugar.....pounds	5,486,276	6	329,176 56
Tallow.....barrels	436	20 00	8,720 00
Turpentine.....gallons	33,270	65	21,625 50
Stone.....cords	62,501	7 00	437,507 00
Timber.....feet	25,284	2	505 68
Wood.....cords	34,604	4 50	155,718 00
Wheat.....bushels	924,734	1 50	1,387,101 00
Wool.....pounds	160,748	35	56,261 80
Total value of receipts by the Illinois and Michigan canal in 1855.....			7,426,262 35

J. D. GRAHAM, *Brevet Lt. Col., Supt'g Engineer, &c.*

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, Dec. 31, 1855.

A 36.

Statement of the quantity and value of articles of merchandise received at the port of Chicago, by railroads, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....barrels..	71,193	\$3 00	\$213,579 00
Barley.....bushels..	140,193	1 00	140,193 00
Beans.....do.....	21,215	2 00	42,430 00
Beef.....barrels..	14,280	13 00	185,640 00
Bran.....tons.....	4,679 ³ / ₄	22 40	104,819 36
Bricks.....M.....	2,193 ¹ / ₂	7 00	15,352 44
Butter.....pounds..	3,481,193	15	522,178 95
Cattle.....number..	16,317	40 00	652,680 00
Coal.....tons.....	6,419	6 00	38,514 00
Corn.....bushels..	5,131,193	65	3,335,275 45
Cranberries.....do.....	1,844	3 00	5,532 00
Eggs.....barrels..	2,347	10 00	23,470 00
Flour.....do.....	239,182	8 50	*2,033,047 00
Grass seed.....bushels..	64,352	2 25	144,792 00
Hams and bacon.....pounds..	439,230	10	43,923 00
Hides.....number..	191,341	4 00	765,364 00
Hogs, live.....do.....	201,344	12 00	2,416,128 00
High wines.....barrels..	19,873	11 00	218,603 00
Horses.....number..	14,392	125 00	1,799,000 00
Iron and nails.....pounds..	8,321,143	3	249,634 29
Lard.....do.....	124,937	10	12,493 70
Lead.....do.....	11,944,183	6	716,650 98
Lumber.....M feet..	10,327 ¹ / ₄	15 00	154,908 84
Meal.....barrels..	9,863	7 00	69,041 00
Merchandise.....tons.....	*94,423	*600 00	56,653,800 00
Milk.....gallons..	19,863	4	794 52
Molasses.....do.....	103,464	40	41,385 60
Oats.....bushels..	2,347,921	35	821,772 35
Pork.....barrels..	37,381	16 00	598,096 00
Pork, in hog.....pounds..	56,231,255	4 ¹ / ₂	2,530,406 47
Potatoes.....bushels..	221,493	1 00	221,493 00
Provisions.....pounds..	*16,734,621	Estimated 10	1,673,462 10
Sheep.....number..	27,269	4 00	109,076 00
Wheat.....bushels..	7,123,457	1 60	11,397,531 20
Wood.....cords....	5,496	6 00	32,976 00
Wool.....pounds..	1,421,299	35	497,454 65
Total value of receipts by railroads in 1855	-----	-----	88,481,497 90

* This is the result of the value of twenty car loads of merchandise, being chiefly dry goods, teas, and the most costly class of articles. They are estimated at \$600 per ton, which is a low estimate.

This statement includes the business of the following railroads, viz: Michigan Central; Michigan Southern and Northern Indiana; Galena and Chicago Union; Illinois Central; Chicago and Rock Island; Chicago, Burlington, and Quincy; Chicago, St. Paul, and Fond du Lac.

J. D. GRAHAM,
Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

A 37.

Statement of the quantity and value of articles of merchandise shipped from the port of Chicago, by lake, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels--	1, 141	\$3 00	\$3, 423 00
Apples, dried ----- bushels--	12, 343	1 50	18, 514 50
Ashes, pot ----- tons--	121	100 00	12, 100 00
Barley ----- bushels--	21, 396	1 00	21, 396 00
Beef ----- barrels--	66, 414	13 00	863, 382 00
Beans ----- bushels--	4, 191	2 00	8, 382 00
Boilers, steam ----- number--	46	1, 500 00	69, 000 00
Brick ----- M--	44	10 00	440 00
Bran and shorts ----- tons--	163	50 00	8, 150 00
Broom corn ----- bales--	7, 598	20 00	151, 960 00
Butter ----- pounds--	587, 934	16	94, 069 00
Corn ----- bushels--	7, 944, 831	65	5, 164, 140 15
Candles ----- boxes--	1, 394	8 00	11, 152 00
Cattle ----- number--	2, 286	50 00	114, 300 00
Coal ----- tons--	385	10 00	3, 850 00
Corn meal ----- barrels--	2, 937	6 00	17, 622 00
Earthenware ----- gallons--	51, 000	10	5, 100 00
Eggs ----- dozen--	191, 844	10	19, 184 40
Fish ----- barrels--	464	9 00	4, 176 00
Flax seed ----- bushels--	3, 158	2 00	6, 316 00
Flour ----- barrels--	115, 316	8 00	922, 528 00
Grass seed ----- bushels--	68, 822	2 25	154, 849 50
Gunpowder ----- tons--	150	1, 500 00	225, 000 00
Hams and bacon ----- pounds--	2, 831, 493	12	339, 779 16
Hay ----- tons--	1, 620	9 00	14, 580 00
Hemp ----- do--	1, 976	100 00	197, 600 00
Hides ----- number--	154, 869	4 00	619, 476 00
High wines ----- gallons--	298, 491	40	119, 396 40
Hogs, live ----- number--	1, 517	15 00	22, 755 00
Iron ----- tons--	1, 864	60 00	111, 840 00
Iron, pig ----- do--	2, 743	45 00	123, 435 00
Lard ----- pounds--	2, 983, 431	10	298, 343 10
Lead ----- do--	9, 776, 200	6	586, 572 00
Lumber ----- M feet--	630	15 00	9, 450 00
Merchandise ----- tons--	5, 448	400 00	2, 179, 200 00
Merchandise ----- packages--	977, 215	7 50	7, 329, 112 50
Molasses ----- gallons--	365, 440	50	182, 720 00
Oats ----- bushels--	3, 471, 983	35	1, 215, 194 05
Oil ----- barrels--	2, 341	45 00	105, 345 00
Oil cake ----- tons--	425	20 00	8, 500 00
Paper ----- reams--	189, 937	3 75	712, 263 65
Pails ----- dozen--	11, 394	2 00	22, 788 00
Peaches ----- barrels--	387	3 00	1, 161 00
Pelts ----- bales--	2, 492	25 00	62, 300 00
Plaster ----- barrels--	563	3 00	1, 689 00
Pork ----- do--	65, 675	15 00	985, 125 00
Potatoes ----- bushels--	17, 724	1 00	17, 724 00
Reapers ----- number--	312	150 00	46, 800 00
Rye ----- bushels--	18, 641	1 25	23, 301 25
Salt ----- barrels--	6, 005	2 50	15, 012 50
Sheep ----- number--	296	3 00	888 00
Shingles ----- M--	295	3 50	1, 032 50

STATEMENT—Continued.

Articles.	Quantity.	Price of each.	Value.
Soap ----- boxes--	2,981	\$5 00	\$14,905 00
Stone ----- cords--	231	8 00	1,848 00
Sugar ----- pounds--	1,618,983	6	97,138 98
Tripe ----- barrels--	312	40 00	12,480 00
Tobacco ----- hogsheads--	3,381	50 00	169,050 00
Vinegar ----- barrels--	378	10 00	3,780 00
Wheat ----- bushels--	6,622,194	1 60	10,595,510 00
Wool ----- pounds--	1,834,963	36	660,586 68
Total value of merchandise shipped from Chicago, by lake, in 1855-----			34,817,716 32

J. D. GRAHAM,

Brevet Lieut. Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 38.

Statement of the quantity and value of articles of merchandise shipped from the port of Chicago, by the Illinois and Michigan canal, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Ashes, pot ----- tons--	5	\$100 00	\$500 00
Bark, tan ----- cords--	671	8 00	5,368 00
Barley ----- bushels--	48,583	1 00	48,583 00
Beans ----- do--	3,988	2 00	7,976 00
Beef ----- barrels--	28	13 00	364 00
Beer ----- do--	5	10 00	50 00
Bran and shorts ----- tons--	4	50 00	200 00
Clocks ----- number--	42,800	2 00	85,600 00
Coal ----- tons--	387	9 00	3,483 00
Coffee ----- pounds--	1,173	12	140 76
Fish ----- barrels--	253	9 00	2,277 00
Flour ----- do--	365	8 50	3,102 50
Fruit ----- pounds--	391,146	10	39,114 60
Grindstones ----- tons--	143	30 00	4,290 00
Gunpowder ----- do--	116	1,250 00	145,000 00
Hams ----- barrels--	1	18 00	18 00
Hair ----- pounds--	1,067	50	538 50
Hemp ----- do--	200	5	10 00
Iron ----- tons--	344	60 00	20,640 00
Iron, pig ----- do--	118	60 00	7,080 00
Iron, railroad ----- do--	3,392	60 00	203,520 00
Laths ----- M--	15,013	2 75	41,286 00
Lead, pigs ----- number--	2,844	1 50	4,266 00
Lime ----- barrels--	1,270	1 50	1,905 00
Lumber ----- M feet--	80,830½	17 50	1,414,533 68

CHICAGO HARBOR, ILLINOIS.

STATEMENT—Continued.

Articles.	Quantity.	Price of each.	Value.
Marble tons	45	\$55 00	\$2,475 00
Meal barrels	1	7 50	7 50
Merchandise tons	192,147	400 00	76,858,800 00
Molasses gallons	827	50	413 50
Nails and spikes kegs	22,525	5 00	112,625 00
Oats bushels	110	35	38 50
Oil barrels	29	40 00	1,160 00
Posts number	32,016	12	3,841 92
Rags tons	4	45 00	180 00
Rosin barrels	190	5 00	950 00
Salt do	25,831	2 00	51,662 00
Shingles M	41,251	3 50	144,379 37
Shingle bolts cords	406	15 00	6,090 00
Shot pounds	50,192	10 00	5,019 20
Steel tons	25	140 00	3,500 00
Sugar pounds	65,078	6	3,904 68
Vinegar barrels	75	10 00	750 00
Wagons number	2,981	65 00	193,765 00
Wheat bushels	109,642	1 50	164,463 00
Staves and heading M	1,344	15 00	20,171 98
Total value of merchandise shipped from Chicago, by the Illinois and Michigan canal, in 1855			79,614,042 70

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 39.

Statement of the quantity and value of articles of merchandise forwarded from the port of Chicago, Illinois, by railroads, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Ale ----- barrels--	2,096	\$10 00	\$20,960 00
Apples ----- do----	1,966	3 00	5,898 00
Ashes, pot ----- tons--	19	100 00	1,900 00
Barley ----- bushels--	47,453	1 00	47,453 00
Beans ----- do----	15,037	2 00	30,074 00
Beef ----- barrels--	17,860	13 00	232,180 00
Butter ----- pounds--	760,240	15	114,036 00
Buckwheat flour ----- barrels--	25	5 00	125 00
Corn ----- bushels--	87,924	65	57,150 60
Cranberries ----- do----	821	3 00	2,463 00
Flour ----- barrels--	103,462	8 50	879,427 00
Grass seed ----- bushels--	10,127	2 25	22,785 75
Ham and bacon ----- pounds--	1,873,789	10	187,378 90
Hides ----- number--	84,392	4 00	337,568 00
Hogs, live ----- do----	159,463	12 00	1,913,556 00
High wines ----- barrels--	6,384	16 00	102,144 00
Iron and nails ----- tons--	21,846	75 00	1,638,450 00
Laths ----- M-----	31,396 4-10	3 00	94,189 20
Cattle ----- number--	7,927	40 00	317,080 00
Coal ----- do----	12,386	10 00	123,860 00
Lead ----- pounds--	18,362	6	1,101 72
Lumber ----- M feet--	147,953 ⁵ / ₈	20 00	2,959,072 50
Lime ----- barrels--	10,281	2 00	20,562 00
Merchandise ----- tons--	171,930	*500 00	85,965,000 00
Oats ----- bushels--	41,263	35	14,442 00
Pork ----- barrels--	46,198	16 00	739,168 00
Pork, in hogs ----- pounds--	26,293,482	4 ¹ / ₂	1,183,206 69
Plaster ----- barrels--	1,983	3 00	5,949 00
Posts, for fences, &c. ----- number--	619,421	12	74,330 00
Potatoes ----- bushels--	57,293	1 00	57,293 00
Rye ----- do----	1,290	1 25	1,612 50
Water lime ----- barrels--	5,848	3 00	17,544 00
Wheat ----- bushels--	598,741	1 60	957,985 00
Wool ----- pounds--	1,129,482	35	395,318 00
Total value of merchandise forwarded from Chicago by railroads in 1855-----			98,521,262 86

* This item (\$500 per ton) is an estimate based upon the actual value of twenty carloads of similar merchandise. This class of merchandise consists of the most valuable kinds, being chiefly broadcloths, dry goods, and groceries of all kinds. The estimated value of \$500 per ton is a low estimate, and quite within bounds.

This statement includes the business of the following railroads, viz: Michigan Central; Michigan Southern and Northern Indiana; Galena and Chicago Union; Illinois Central; Chicago and Rock Island; Chicago, Burlington, and Quincy; Chicago, St. Paul, and Fon du Lac.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Col., Superintending Engineer.

OFFICE OF GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 40.

Statement of the value of the different kinds of merchandise sold to retailers by the principal wholesale merchants of the city of Chicago, for the year ending December 31, 1855.

Liquors of all kinds.....	\$1,761,000
Soap and candles.....	750,000
Dry goods, (of all kinds).....	8,180,000
Hardware and cutlery.....	2,650,000
Groceries.....	14,000,000
Oils and paints.....	780,000
Tobacco and segars.....	1,450,000
Drugs and medicines.....	1,100,000
Hats and caps.....	750,000
Boots and shoes.....	2,600,000
Paper of all kinds.....	840,000
Ship chandlery.....	1,090,000
Straw goods, (hats, bonnets, &c.).....	1,000,000
Furs.....	520,000
Fancy goods.....	420,000
Saddlery.....	400,000
Willow ware, (such as baskets, &c).....	400,000
Leather and findings.....	1,630,000
Iron.....	2,100,000
Books and stationery.....	1,754,000
Clothing.....	2,465,000
India rubber goods.....	275,000
Wooden ware.....	225,000
Furniture.....	1,618,000
Crockery and stone ware.....	1,128,000
Looking-glasses and pictures.....	300,000
	50,186,000

This statement does not include that part of the wholesale trade that is combined in the same establishments with the retail trade of the city of Chicago. I think it would be a low estimate of the whole city trade of Chicago, both wholesale and retail, to estimate it at one hundred millions of dollars—that is to say, one hundred millions of dollars for the year 1855.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 41.

Statement of the number, tonnage, and value of vessels that arrived at the port of Chicago for the year ending December 31, 1855.

Number of vessels.....	6,271
Tonnage.....	1,213,201
Value.....	\$42,462,035

Estimated at \$35 per ton, which is a low estimate, including both steam and sailing vessels.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 42.

Statement of the actual amount of tonnage of the port of Chicago, giving the name and tonnage of each vessel owned at the port of Chicago on the 31st of December, 1855.

Class of vessels.	Names of vessels.	Tonnage.
Steamboat.....	Superior.....	567 17
Do.....	Traveller.....	603 76
Tug.....	Kossuth.....	118 60
Do.....	Archimides.....	49 78
Propeller.....	Forest Queen.....	467 00
Do.....	Robert H. Foss.....	259 49
Do.....	Ogontz.....	343 37
Do.....	Montezuma.....	322 63
Tug.....	F. Follett.....	69 63
Do.....	Franklin.....	39 32
Do.....	Hiram Warner.....	65 28
Barque.....	Grace Greenwood.....	377 42
Do.....	Waverly.....	344 57
Do.....	Ocean Wave.....	308 19
Do.....	Norman.....	345 53
Brig.....	S. F. Gale.....	266 24
Do.....	Minnesota.....	266 82
Do.....	Enterprise.....	225 89
Do.....	Mary.....	240 36
Do.....	C. B. Blair.....	212 36
Do.....	Mohegan.....	248 09
Do.....	A. R. Cobb.....	226 07
Do.....	Portland.....	250 13
Do.....	Robert Hollister.....	272 07
Do.....	Belle.....	276 02
Do.....	Montezuma.....	284 63
Do.....	J. H. Harman.....	301 78
Do.....	Oleander.....	262 58
Do.....	Missouri.....	153 17
Do.....	Cortland.....	234 76
Do.....	James McBride.....	271 85
Do.....	Mechanic.....	312 26
Do.....	Ramsey Crooks.....	228 43
Do.....	F. B. Gardner.....	460 78
Do.....	Susan A. Clark.....	163 73
Do.....	F. C. Clark.....	266 45
Do.....	Ontario.....	130 68
Do.....	Fanny Gardner.....	327 42
Do.....	David Smart.....	203 14
Do.....	Geneva.....	207 77
Do.....	S. C. Wolbridge.....	237 16
Do.....	Saint Louis.....	210 80
Do.....	Champlain.....	270 28
Do.....	Powhatan.....	234 41
Do.....	Ellen Parker.....	332 93
Do.....	Alexander Mitchell.....	275 56
Do.....	Sandusky.....	225 68
Schooner.....	Racine.....	223 38
Do.....	Maria Hilliard.....	194 88
Do.....	Buena Vista.....	174 03
Do.....	G. R. Roberts.....	119 32
Do.....	John Lillie.....	95 85
Do.....	Roanoke.....	161 39
Do.....	James McKay.....	125 36

A 42—Continued.

Class of vessels.	Names of vessels.	Tonnage.
Schooner	Honest John	117 85
Do.	George C. Drew	130 57
Do.	Citizen	53 81
Do.	Champlain	205 73
Do.	H. W. King	99 20
Do.	E. Henderson	90 03
Do.	M. H. Sibly	252 18
Do.	Baltic	96 04
Do.	Industry	43 88
Do.	Henry Norton	150 53
Do.	Astor	85 20
Do.	Meridian	243 77
Do.	Mary G. Bonesteel	105 65
Do.	Andromeda	207 15
Do.	Elbe	79 63
Do.	P. Hagden	168 34
Do.	Speed	146 26
Do.	Welland	198 90
Do.	E. G. Gray	166 18
Do.	Main	194 79
Do.	Pilot	180 82
Do.	Levant	165 12
Do.	Curlew	274 69
Do.	Frank Miller	39 21
Do.	Col. Shepard	48 27
Do.	Spartan	92 59
Do.	Francis	120 32
Do.	Arago	263 49
Do.	Mary	77 00
Do.	Traveller	266 56
Do.	North Yuba	154 42
Do.	Iowa	367 49
Do.	Coral	206 72
Do.	Muskegan	109 55
Do.	Henry Clay	59 40
Do.	Abigail	178 18
Do.	Albatross	234 62
Do.	Triumph	120 54
Do.	Stella	176 71
Do.	Gem	306 43
Do.	Daniel Marble	213 68
Do.	Japan	245 25
Do.	Two Charlies	119 40
Do.	Fashion	223 35
Do.	Advance	268 40
Do.	Pilgrim	228 55
Do.	John S. Wallace	76 68
Do.	Henrietta	81 01
Do.	Blue Bell	150 16
Do.	Ospray	247 64
Do.	Kenosha	377 90
Do.	Home	127 59
Do.	J. M. Hughes	165 59
Do.	Telegraph	276 33
Do.	H. N. Gates	168 78
Do.	Wyoming	232 61
Do.	Calcutta	116 26
Do.	George Hanson	37 81
Do.	Lady Jane	147 12

A 42—Continued.

Class of vessels.	Names of vessels.	Tonnage.
Schooner	Amelia	36 52
Do	Wm. H. Hinsdale	61 19
Do	Hero	79 70
Do	St. Lawrence	134 74
Do	St. Mary's	253 25
Do	Arrow	73 04
Do	C. Walker	164 15
Do	Seventy-Six	76 36
Do	Oconto	306 08
Do	L. P. Hilliard	175 16
Do	N. C. Walton	127 41
Do	Whirlwind	154 61
Do	George F. Foster	123 89
Do	Falcon	181 59
Do	Temperance	156 57
Do	C. P. William	434 03
Do	Peter Doling	60 57
Do	Major Kirby	95 63
Do	Chalarope	371 24
Do	Ashtabula	133 44
Do	Poland	233 66
Do	Farfar	170 49
Do	Wm. Jones	209 88
Do	Nile	250 53
Do	Mary	212 18
Do	Caledonia	137 23
Do	George M. Chapman	318 18
Do	Cherokee	203 85
Do	Arabella	66 25
Do	Mars	27 73
Do	Vincennes	185 30
Do	Caledonia	82 10
Do	Anne Thorine	92 92
Do	Denmark	363 63
Do	C. Y. Richmond	229 45
Do	Queen of the West	292 16
Do	Pioneer	88 76
Do	Sir Wm. Wallace	87 82
Do	Harriet Ross	229 82
Do	Bonnie Doon	348 16
Do	Island	37 67
Do	John W. Sargent	148 49
Do	E. M. Shoyer	139 84
Do	Armada	235 44
Do	Tuscola	221 21
Scow	Mount Vernon	40 81
Do	Sachem	74 81
Do	Globe	48 76
	Total	31,108 59

Value of the same estimated at \$35 per ton, which is a low valuation,
taking the steamboats, steam propellers, and sailing vessels all to-
gether \$1,088,801 74

J. D. GRAHAM,
Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,
Chicago, December 31, 1855.

A 43.

Statement of the amount of hospital fees collected by the collector of customs at the port of Chicago for the year ending December 31, 1855, in comparison with the year 1854.

First quarter 1855	\$55 47
Second quarter 1855	1,033 61
Third quarter 1855	523 77
Fourth quarter 1855	140 22
Total collected in the year 1855	1,753 07
Collected in the year 1854	1,393 68
Difference in favor of the year 1855	359 39

I am indebted to P. Conley, esq., collector for the port of Chicago, for the above statement.

J. D. GRAHAM,

Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 44.

Statement of the quantity and value of articles of foreign merchandise received at the port of Chicago from foreign countries in American vessels during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beer.....gallons.....	1,600	\$0 80	\$1,280 00
Pig iron.....cwt.....	1,960	1 00	1,960 00
Salt.....bushels.....	5,295	1 00	5,295 00
Wine, in bottles.....dozens.....	23	7 73	168 59
Articles consisting of wearing apparel, wool- en and cotton goods, and manufactures of wood			46,689 23
Total value of foreign merchandise received from foreign countries, in American vessels, at Chicago, in the year 1855.....			55,392 82

J. D. GRAHAM,

Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

A 45.

Statement of the quantity and value of articles of foreign merchandise received at the port of Chicago from foreign countries, in foreign vessels, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Bar iron-----cwt.---	2,773	\$13 00	\$36,049 00
Pig iron-----do-----	9,777	1 00	9,777 00
All other articles, such as manufactures of wood, wearing apparel, woolen, and a small portion of cotton goods-----			180,000 00
Total value of foreign merchandise received from foreign countries, in foreign vessels, at Chicago, in the year 1855-----			225,826 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

2. WAUKEGAN BREAKWATER.

For an exhibition of the position and dimensions decided upon for this work, and in illustration of the views contained in this report, I beg leave to refer to the accompanying map, G No. 29, projected (on a scale of $\frac{1}{2400}$, or 200 feet to one inch,) from an accurate triangulation and survey made under my direction in July, 1855.

The position D E, upon the map, is that which was recommended by the board of engineers in their report of the 16th of May, 1853, giving to it a length of 1,365 feet, and placing it in twenty feet depth of water. The cost of the work was estimated by Mr. William Gamble, then United States agent, at \$99,938 90.

Under the instructions of the War Department to present a plan for the work which would bring its cost of construction within the estimate originally presented to Congress, its contemplated length was reduced to 700 feet, and the position A C, shown upon the map, was assigned to it. The leading conditions were, that the breakwater was to be placed in a depth of twenty feet of water, which would bring its direction nearly parallel with the lake shore, and give for it a width at base of twenty-five feet, and a height of twenty-five feet from bottom to top. According to the maps then extant its distance lakeward from the outer or eastern extremity of Dickerson's bridge wharf was given as 350 feet, but, according to the map herewith presented, and a careful determination of the position by triangulation, this distance is 425 feet, thus giving a little more room for anchorage of vessels behind the breakwater.

In my general report, No. 73, to the bureau, dated the 29th of April last, it was stated that the working season of 1854 was occupied in obtaining, hauling in, and dressing oak timber sufficient to construct five cribs, each thirty to thirty-two feet long, twenty-five feet wide, and twenty-five feet high for this breakwater. This oak timber could be obtained in no other way, at a reasonable price, than by making contracts for it as it stood in the forest, and cutting and hauling it as we required it, and having it dressed at our own yard. It cost, in this way, less by about two cents per lineal foot, of one foot square, (or per cubic foot,) than it could have been obtained for under the usual mode of contract, nor has it cost more than pine could have been contracted for at this locality. For this reason oak has been used for the portions of this work both above and below the water surface.

The mode of construction adopted for this work, is that shown by the several drawings in the accompanying sheet, marked G No. 21, or case third of crib work. The bolts used are all of round wrought iron one and a half inch in diameter, and the timber for the body of each crib is white oak dressed one foot square.

On the 18th of May, 1855, which was the earliest practicable period for resuming work at this place, the requisite party was organized, and the work was commenced of putting the machinery in order, and of framing together the timbers, previously dressed, into cribs, and of sinking those cribs in position to form the desired breakwater.

Had the summer and autumn of this year been as favorable to this sort of work on the lake, as the previous season was, or indeed as the average of seasons, we should have been enabled, with the means remaining on hand, to have completed the framing together and sinking in position of five cribs, and thus to have formed 154 feet of the breakwater. But, unfortunately, the season proved to be one of a continued succession of severe and destructive storms, causing a loss of property, by shipwrecks and damages on the great western lakes, to an amount of about two millions eight hundred thousand dollars within the year 1855,* and causing an unavoidable expenditure of time and money in contending against their violence at this place, instead of progressing, with a regular pace, in the erection of the breakwater.

This locality, as a reference to the map will show, affords no shelter against the action of the sea during the process of putting the timbers together in framing the cribs. After laying the latticed bottom and building up two or three tiers of timbers above it, it became necessary to launch this much of the work into the lake, and secure it afloat by means of the requisite anchors and cables. As the draught of water increased, by the process of building up, the frame was removed and anchored further out into the lake. In ordinary seasons there are periods of weather sufficiently calm or moderate to allow of the completion of one of these cribs, and of sinking it in position by means of the stone ballast used for this purpose.

In the meantime, should an ordinary gale of wind occur, such as is usual in the summer season, it can be rode out by the security afforded

* See the published annual report of Captain D. C. Dobbins, to the Convention of Lake Underwriters, held at Buffalo the present season.

by the anchors and cables, and upon these we must depend in such localities.

On the 16th of July the first crib was launched into the lake, and the work of raising the frame was pushed as fast as possible all of that and the following day. A severe gale then occurred, which continued for three days, during which the work had to be suspended, and attention given to the security of the floating crib, pile-driver, and other machinery.

For a detailed account of the progress of the work, and of the storms which interrupted it during the usual working season, I would refer to the accompanying report of custodian agent Reuben Emerson, marked B 1.

It will be seen by that report that, after a laborious season, chiefly spent in contending against the violence of storms, one crib was secured in position, (marked B on the accompanying map,) and a second one, when nearly completed and nearly ready to be sunk in position, was lost by the violent gale from the northeast, which commenced on the 25th of August, and continued for three days with unabated force. Two days more of moderate weather would have enabled us to complete this crib and to have secured it, filled with stone ballast, in its proper position.

The crib B (see map) has maintained its position, unmoved, throughout several severe storms, and seems fully to confirm the efficiency of the plan of construction shown in detail in sheet G No. 21.

The appropriation for this work is now exhausted, but it leaves on hand oak timber, dressed and ready to be framed, sufficient for forming three cribs, each 32 feet long, 25 feet wide, and 25 feet high; also machinery and other property which is estimated to be worth \$2,000. Unless another appropriation be made for continuing the work, this property will have to be sold, or transferred to some other public work on this lake, under the regulation of the department, to meet arrearages which now amount to the sum of \$1,600.

The importance of the Waukegan breakwater is not limited to the accommodation required for the trade of this particular locality. It extends to that of the general commerce of our great western lakes, owing to the great facility it would afford to all vessels for reaching a safe anchorage behind it during the violence of the northerly, northeasterly, or southeasterly gales, which are so frequent upon this lake.

In illustration of this point, I beg leave to quote from my general report, No. 73, to the bureau, of the 19th of April last, the following remarks, viz :

“ The rivers which enter this lake from the west nearly all do so upon a course nearly east, or somewhat south of east. They are all so narrow at their mouths that vessels attempting to enter them from the northward, in a strong northerly gale, are frequently unable to luff quick enough for doubling the windward pier, and, for want of sufficient sea room between the piers, are often carried entirely to leeward of the harbor entrance, and stranded on the lake shore.

“ Under the same circumstances, these vessels would experience no difficulty in reaching a safe anchorage behind such a breakwater as this. The ample room between it and the shore would enable them,

by an easy course, to reach the anchorage affording the desired shelter. Equal facilities are afforded, by the breakwater, to vessels seeking shelter under a gale from the southward. A single glance at the map will demonstrate this."

To the above remarks I feel called upon to add, from a close observation since I took my station here, upon the general effect of severe gales upon the shipping, that sufficient protection cannot, under these circumstances, be secured to it without the construction of several such breakwaters at different points on the coast of Lake Michigan. These points should be selected not so much with regard to the favoring of particular localities as to affording harbors of refuge of easiest access to shipping generally. If once constructed, their usefulness would soon be demonstrated by the security they would afford to many a vessel which, after having failed in a storm to luff-to quick enough to make a harbor within the narrow-mouthed rivers on the coast, and being driven to leeward of them, would, by a leading wind, or upon an easy course, afforded by the same wind, be enabled to come to a safe anchorage behind these works. The accommodation they would afford would not be confined to the commerce of Lake Michigan alone, but would extend in an equal degree to that of all the great western lakes with which there is intercommunication during the season of navigation.

I herewith submit an estimate, marked B 2, of the cost of completing this breakwater to a length of 720 feet,* upon the plan of construction shown by the drawings upon sheet G No. 21, amounting to \$67,851. Also, another estimate, marked B 3, of the cost of constructing the work to a length of 1,380 feet,* as originally designed, amounting to the sum of \$137,966.

The greater length of breakwater is evidently necessary to afford the necessary protection to shipping and the necessary extent of roadstead, and I would, therefore, respectfully recommend that it be adopted, and that the amount of estimate B 3 (viz: \$137,966) be adopted in the appropriations to be asked for this work. Its excess over the estimate of Mr. William Gamble, late agent for the work, submitted in May, 1853, arises from two causes: *First*. The cost of timber and the labor of carpenters are greater now than they were then. *Second*. The plan proposed for the construction is different. The middle longitudinal wall, shown in the plan on sheet G No. 21, was not contemplated in Mr. Gamble's estimate, nor was the latticed bottom for the cribs then contemplated, as drawn in figure 1 of that sheet. He estimates only 864 pounds, or thereabout, of iron bolts for each crib of 30 feet long, 25 feet wide, and 25 feet high, whereas our estimate of this item for such a crib is 7,212 pounds. Experience has fully shown, I think, that unless the timbers for such a breakwater are thus firmly bolted together, the work would be inadequate to resist the action of the sea waves in times of severe storms, in the exposed position which a breakwater must always occupy.

* It will be seen by the estimates that, in order to avoid a fraction of a crib in construction, we arrive at the lengths of 720 feet and 1,380 feet for the breakwater, under the two conditions, in lieu of 700 and 1,365.

Waukegan is a port of delivery for foreign importations, and belongs to the district of Chicago; a deputy collector is stationed here.

There is a light-house here, situated within the town, on a commanding bluff, at the intersection of Broad and Lake streets.

The enrolled tonnage belonging to this port on the 31st of December, 1855, consisted of 3 schooners, measuring $401\frac{4}{5}$ tons. Statement B 8 shows that—

The number of arrivals and departures of vessels during the navigable season, say from March 1 to December 31, 1855, was 1,840.

The average number during that period was, per day, 6.

The amount of tonnage of vessels arriving and departing, during the same period, was 1,119,116 tons.

The average daily tonnage arriving and departing during that period was 3,657 tons.

No revenue from foreign importations was collected at this port during the year 1855.

The amount and value of the commerce of this place, during the year 1855, is shown by the accompanying tabular statements, B 4, B 5, B 6, and B 7, to have been as follows, viz:

IMPORTS.

- | | |
|---|--------------|
| 1. By lake shipments, (see statement, B 4,) | \$528,319 87 |
| 2. By railroad, (see statement, B 5)..... | 220,935 32 |

Total value of imports at Waukegan, Illinois, in the year 1855.....	\$749,255 19
--	--------------

EXPORTS.

- | | |
|---|--------------|
| 1. By lake shipments, (see statement, B 6,) | \$491,408 00 |
| 2. By railroad, (see B 7)..... | 179,922 69 |

Total value of exports from Waukegan, Illinois, in the year 1855.....	671,330 69
--	------------

Aggregate value of the commerce of the port of Waukegan, Illinois, in the year 1855.....	1,420,585 88
---	--------------

That is to say, one million four hundred and twenty thousand five hundred and eighty-five dollars and eighty-eight cents.

A branch railroad is determined on from Waukegan, to connect with the Fox river Valley and Wisconsin Central Railroad.

This improvement would greatly increase the commerce of Waukegan, for a large region of very fertile land lies immediately west of this town, and the facilities for transportation are only needed to increase cultivation, and thus augment the great source of commerce here.

B 1.

Custodian agent Reuben Emerson's report to Colonel Graham.

OFFICE OF UNITED STATES CUSTODIAN,
Waukegan, October 31, 1855.

SIR: In compliance with the requirements contained in your letter of 22d instant, I proceed to lay before you the following annual report on the harbor improvements under my charge during the past season as custodian agent. The work of sinking cribs in the lake this season has been prosecuted under great disadvantages in consequence of extremely rough and stormy weather during the entire season.

The work was resumed on the 18th day of May last, and the time was occupied from that day up to July 16th following, in getting the scows, pile-driver, and the necessary tools in order, and working position, and in framing crib-work, and also in building one bridge wharf of 16 feet in width, and extending 95 feet from the shore into the lake, and one pile-driver dock of 16 feet in width and 35 feet long.

Our pile-driver being constructed separate from the scow, it became necessary to construct a dock for its safe depository when not in use, and for readily shipping off and on to the scow when required.

My note-book, to which I refer for dates and circumstances, says: *July 16th*, launched the first crib into the lake; *17th*, continued the work of building up the crib in the lake; *18th*, at 12 o'clock, noon, crib built 10 feet high, and anchored in 14 feet of water; *18th, half past one o'clock p. m.*, wind commenced blowing a heavy gale from northeast; *18th, at seven o'clock p. m.*, lake very rough; all things belonging to the public works considered safe; *July 19th, 6 o'clock a. m.*, one scow parted her chain cable and was driven on shore, leaving her anchor in the lake; crib ashore also, and resting against the south bridge wharf, causing damage to the wharf. This day occupied in getting crib afloat again; the storm continued through the day.

20th, 6 o'clock a. m., storm considerably abated. This day occupied in getting the scow off from the beach and back to anchor.

21st. The work of building up the crib in the lake was resumed; neither scow nor crib sustained injury in going ashore.

From *July 21* up to *August 9*, the weather being tolerably favorable for the advancement of the work, it had progressed so far as to have built up the first crib to 21 feet high and placed it in position, and containing twenty cords of stone, the stone having been put in the crib the day previous.

On the 9th, 10th, and 11th days of August, the work on the water was suspended in consequence of another heavy gale of wind from the southeast, causing damage, by raising the south end of the crib from the ground about three feet, allowing the stone to escape from underneath the bottom timbers. *August 13.*—Resumed the work of filling up crib with stone, and commenced the foundation of the second crib by putting together the timbers on land.

From 13th to 25th of *August*.—The work progressed without any serious interruption. On Saturday, *August 25th*, the work had so far advanced as to have completed the filling of the first crib; and the second crib was built up to 19 feet high and nearly ready for filling with stones, and was held in its position where it was designed to be sunk by a three-fourths inch iron chain cable fastening the two cribs together.

Early on Sunday morning, *August 26th*, a violent gale; the second crib was broken loose from the first by parting the chain cable with which it was held and was driven on shore.

At the same time, both the scows went on shore, dragging both their anchors and causing one scow to sink in 9 feet water, and the other scow was driven on the beach. *On the night of the 25th* commenced the most severe gale of this season, continuing for three days, and causing the greatest portion of damage to the work. This was a northeast gale, and one that is seldom equalled for its severity, and one that has caused more damage and loss of life and property on Lake Michigan than any other this season.

The extent of damage done to the harbor works here by this storm can hardly be estimated less than the loss of one crib; the crib being driven high on the bar, and having to remain there until the scow which was sunk could be raised and repaired in order to enable us to use the scow in lightening up the crib so as to be able to move it, which occupied the time from *August 27th to September 15th*, at which time we had succeeded in getting the crib back to its place again without apparently having suffered much damage, but in reality it proved to have been damaged more than we were aware of, as it afterwards appeared

After having ascertained the full extent of damages done on the crib, the bottom portion or grillage being broken off, and another section, comprising six or seven tiers of timbers in height, having become partly detached, and that the repairs could not be made without taking the whole out of the water, I was induced to offer as my opinion that it would not be practicable to attempt to repair and sink the second crib this season; and as the weather has proved, from that time up to the present, very boisterous, I think it cannot be considered otherwise than fortunate that you determined to close the work at once.

Immediately after receiving your instructions of the 15th instant, authorizing the work to be closed, I proceeded to secure portions of the second crib, that were then exposed in the lake, by hauling them upon the beach, and also both scows and the pile-driver, and placing them in a safe position from the effects of the lake waves, and in repiling a considerable quantity of timber that was hauled to the beach preparatory to being used on the cribs.

There is one portion of the crib, comprising three tiers of timbers in height, lying on the beach, which has been in its present position since the 27th of August, and is now in a very bad position to move, it being entirely under water and nearly buried in sand. I had thought it advisable not to meddle with or disturb it unless at your special direction, as I am satisfied it will cost quite as much or more to get it upon land than it will be worth.

The work was brought to a close, and all the men discharged, on the 29th instant, with the exception of one man that I have retained for the purpose of assisting me in keeping a light upon the crib at night, until the close of navigation.

I am, sir, very respectfully, your obedient servant,

REUBEN EMERSON,

United States Custodian Agent.

B 2.

Estimate of the cost of completing the Waukegan breakwater to a length of 700 feet, as per trace A C on the accompanying map, marked G No. 29, the width and height above the bottom being, each, 25 feet.

1. For a single crib, 30 feet long, 25 feet wide, and 25 feet high :

For 4,391 lineal feet of white oak timber, one foot square, at 20 cents per lineal foot	\$878 20
For 1,728 feet, board measure, of 3-inch oak plank for flooring, at \$20 per M.....	34 56
For 7,212 lbs. 1½ inch round wrought-iron for bolts, at 4 cent per lb.....	288 48
For 127 lbs. of wrought-iron spikes ¾ by ¾ of an inch square, at 7½ cents per lb.....	9 52
For 98.82 cords of hard boulder stone, at \$8 per cord of 128 cubic feet.....	790 56
Estimated cost of materials.....	2,001 32
For carpenters' work in dressing timber, cutting dove- tails and gains.....	376 00
For putting together and filling with stone.....	220 00
For hauling timber and stone pier.....	50 00
For superintendence by local agent.....	250 00
	2,897 32
Add 10 per cent. for contingencies, such as office rent, fuel, transportation, pay of draughtsmen, and unfore- seen expenses.....	289 73
Estimated cost of one crib.....	3,187 05

For 700 feet of breakwater, there will be required 20 cribs, each 30 feet long,* in addition to the one now placed in position, and the three others the timbers for which are now dressed and ready to be framed.

* As the small fraction of a crib must be avoided in the construction, these 20 additional cribs will cause the length of the breakwater to be 720 feet.

20 cribs, at \$3,187 05 each.....	\$63,751 00
200 cords of stone, in addition to what is on hand, required for these three cribs, at \$8 per cord.....	1,600 00
For workmanship and superintendence in finishing and sinking in position these three cribs, at \$300 each....	900 00
For arrearages now due.....	1,600 00
Estimated amount required to complete the Waukegan breakwater to a length of 700* feet.....	67,851 00

J. D. GRAHAM,
Brevet Lieutenant Colonel, Superintending Engineer.
 OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
 Chicago, December 31, 1855.

B 3.

Estimate of the cost of completing the Waukegan breakwater to a length of 1,365 feet, as per the trace of position D E on the accompanying map, G No. 29 ; the width and height being, each, 25 feet.

1. For completing to a length of 720 feet, as per preceding estimate, marked B 2.....	\$67,851 00
2. For 22† additional cribs, at \$3,187 05 each.....	70,115 10
Estimated amount required.....	137,966 10

J. D. GRAHAM,
Bvt. Lieut. Col., Superintending Engineers, &c.
 OFFICE GENERAL SUPERINTENDENCE, &c.,
 Chicago, December 31, 1855.

* As the small fraction of a crib must be avoided in the construction, these 20 additional cribs will cause the length of the breakwater to be 720 feet.

† Again : to avoid the fraction of a crib, in construction, we shall have a total length of 1,380 feet for the breakwater, instead of 1,365, which will be better for the work, and would scarcely cost more than the lesser length.

B 4.

Statement of the quantity and value of articles of merchandise received by lake shipments at the port of Waukegan, State of Illinois, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Lumber.....M feet..	6,514 $\frac{3}{4}$	\$15 00	\$97,721 85
Lath.....M.....	1,217	3 00	3,651 00
Shingles.....do.....	827	3 50	2,894 50
Fence pickets.....do.....	175	14 00	2,450 00
Shingle bolts.....cords..	156	14 00	2,184 00
Tan bark.....do.....	150	8 00	1,200 00
Merchandise.....tons.....	500	500 00	250,000 00
Merchandise.....boxes.....	1,769	20 00	35,380 00
Merchandise.....barrels.....	241	40 00	9,640 00
Merchandise.....bags.....	362	6 00	2,172 00
Bar iron.....tons.....	171	100 00	17,100 00
Coal.....do.....	310	6 00	1,860 00
Stoves.....do.....	81	100 00	8,100 00
Pig iron.....do.....	38	40 00	1,520 00
Sugar.....barrels.....	219	17 00	3,723 00
Liquor.....do.....	803	20 00	16,060 00
Vinegar.....do.....	123	5 00	615 00
Oil.....do.....	82	50 00	4,100 00
Salt.....do.....	1,800	2 00	3,600 00
Salt.....bags.....	2,168	14	303 52
Apples.....barrels.....	853	2 50	2,132 50
Nails.....kegs.....	1,331	5 00	6,655 00
White lead.....do.....	766	2 25	1,723 50
Water lime.....do.....	215	2 00	430 00
Malt.....bags.....	177	2 00	354 00
Grindstones.....tons.....	15	120 00	1,800 00
Marble.....pieces.....	132	8 00	1,056 00
Scythes.....dozen.....	74	10 00	740 00
Snathes.....do.....	68	7 00	476 00
Pitchforks.....do.....	106	7 00	742 00
Shovels.....do.....	83	11 00	913 00
Hoes.....do.....	40	6 00	240 00
Rakes.....do.....	50	2 00	100 00
Pails.....do.....	320	2 00	640 00
Wagons.....number.....	100	100 00	10,000 00
Chair stuff.....bundles.....	97	3 00	291 00
Leather.....rolls.....	147	35 00	5,145 00
Threshing machines.....number.....	28	350 00	9,800 00
Grass cutting machines.....do.....	11	130 00	1,430 00
Horse rakes.....do.....	119	7 00	833 00
Corn-shellers.....do.....	75	10 00	750 00
Corn mills.....do.....	3	50 00	150 00
Hay presses.....do.....	3	200 00	600 00
Ploughs.....do.....	22	12 00	264 00
Live cattle.....do.....	25	40 00	1,000 00
Household goods.....tons.....	101	150 00	15,150 00
Empty barrels.....number.....	1,400	45	630 00
Total value of merchandise received by lake at Waukegan, Illinois, in 1855.....			528,319 87

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

B 5.

Statement of the quantity and value of articles of merchandise received at the port of Waukegan, Illinois, by railroad, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels--	1, 047	\$2 50	\$2, 617 50
Apples, dried ----- do-----	300	15 00	4, 500 00
Bar iron ----- tons-----	35	100 00	3, 500 00
Corn-planters ----- number--	78	4 00	312 00
Corn-shellers ----- do-----	30	10 00	300 00
Chair stuff ----- bundles--	228	3 00	684 00
Hoes ----- dozens-----	35	6 00	210 00
Household goods ----- lots-----	59	50 00	2, 950 00
Iron planing-machine ----- number--	1	500 00	500 00
Lath engine ----- do-----	1	800 00	800 00
Live cattle ----- do-----	128	40 00	5, 120 00
Leather ----- rolls-----	96	35 00	3, 360 00
Liquor ----- barrels--	435	20 00	8, 700 00
Lumber ----- M feet-----	73	15 00	1, 095 00
Marble ----- pieces-----	275	8 00	2, 200 00
Merchandise ----- tons-----	119	500 00	59, 500 00
Merchandise ----- boxes-----	1, 550	20 00	31, 000 00
Merchandise ----- bales-----	1, 493	30 00	44, 790 00
Merchandise ----- bags-----	155	6 00	930 00
Merchandise ----- barrels--	618	40 00	24, 730 00
Molasses ----- do-----	70	17 00	1, 190 00
Nails ----- kegs-----	50	5 00	250 00
Pails ----- dozens-----	180	2 00	360 00
Pianos ----- number-----	10	200 00	2, 000 00
Pitchforks ----- dozens-----	75	7 00	525 00
Peaches, dried ----- barrels--	100	16 00	1, 600 00
Ploughs ----- number-----	9	12 00	108 00
Rakes ----- dozens-----	25	2 00	50 00
Salt ----- barrels--	307	2 00	614 00
Salt ----- bags-----	350	14	49 00
Scythes ----- dozens-----	65	10 00	650 00
Seed wheat ----- bushels--	165	1 50	247 50
Sheep ----- number-----	229	2 50	572 50
Shovels ----- dozens-----	55	11 00	605 00
Snathes ----- do-----	50	7 00	350 00
Steam engine ----- number-----	1	800 00	800 00
Stoneware ----- pieces-----	1, 625	50	812 50
Stoves ----- tons-----	15	100 00	1, 500 00
Sugar ----- barrels--	266	20 00	5, 320 00
Vinegar ----- do-----	80	5 00	400 00
Wagons ----- number-----	35	100 00	3, 500 00
White lead ----- kegs-----	489	2 25	1, 100 25
Water lime ----- barrels--	265	2 00	530 00
Total value of merchandise received by railroad at Waukegan, in 1855-----			220, 935 32

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

B 6.

Statement of the quantity and value of articles of merchandise shipped by lake vessels from the port of Waukegan, Illinois, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Barley ----- bushels--	5,711	\$0 80	\$4,568 80
Beans ----- do -----	200	1 50	300 00
Corn ----- do -----	34,069	55	18,737 95
Flax seed ----- do -----	85	1 25	106 25
Grass seed ----- do -----	2,690	2 25	6,052 50
Oats ----- do -----	183,058	35	64,070 30
Potatoes ----- do -----	570	75	427 50
Rye ----- do -----	1,417	60	850 20
Wheat ----- do -----	168,350	1 30	218,855 00
Corn meal ----- barrels--	210	3 00	630 00
Eggs ----- do -----	7	10 00	70 00
Beef ----- do -----	75	10 00	750 00
Fish ----- do -----	516	9 00	4,644 00
Flour ----- do -----	3,333	8 00	26,664 00
Lard ----- do -----	221	20 00	4,420 00
Merchandise ----- do -----	183	40 00	7,320 00
Pork ----- do -----	1,962	15 00	29,430 00
Flax ----- tons -----	28	100 00	2,800 00
Hides ----- do -----	112	200 00	22,400 00
Merchandise ----- do -----	21	500 00	10,500 00
Pressed hay ----- do -----	123	12 00	1,476 00
Wool ----- do -----	83	650 00	53,950 00
Empty barrels ----- number--	544	1 25	680 00
Live cattle ----- do -----	25	40 00	1,000 00
Reapers ----- do -----	3	100 00	300 00
Hams ----- casks -----	121	28 00	3,388 00
Wood ----- cords -----	300	3 00	900 00
Brooms ----- dozen -----	77	2 50	192 50
Butter ----- firkins -----	360	15 00	5,400 00
Leather ----- rolls -----	15	35 00	525 00
Total -----			491,408 00

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

B 7.

Statement of the quantity and value of articles of merchandise forwarded from the port of Waukegan, Illinois, by railroad, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Barley.....bushels..	575	\$0 80	\$460 00
Beans.....do.....	197	1 50	295 50
Corn.....do.....	569	55	312 95
Flax seed.....do.....	106	1 25	132 50
Grass seed.....do.....	509	2 25	1,145 25
Oats.....do.....	4,965	35	1,737 75
Potatoes.....do.....	5,183	75	3,887 25
Rye.....do.....	75	60	45 00
Beef.....barrels..	53	10 00	530 00
Corn meal.....do.....	5	3 00	15 00
Eggs.....do.....	229	10 00	2,290 00
Fish.....do.....	574	9 00	5,166 00
Flour.....do.....	875	8 00	7,000 00
Lard.....do.....	27	20 00	540 00
Merchandise.....do.....	275	40 00	11,000 00
Pork.....do.....	165	15 00	2,475 00
Broom corn.....tons..	4	100 00	400 00
Flax.....do.....	19	100 00	1,900 00
Hides, green.....do.....	100	100 00	10,000 00
Merchandise.....do.....	15	500 00	7,500 00
Rags.....do.....	12	60 00	720 00
Shorts.....do.....	26	10 00	260 00
Bricks.....M.....	40 $\frac{1}{8}$	6 00	240 76
Cattle, live.....number..	40	40 00	1,600 00
Doors.....do.....	800	1 50	1,200 00
Empty barrels.....do.....	4,922	1 25	6,152 50
Hogs.....do.....	175	10 00	1,750 00
Hoop poles.....M.....	20	10 00	200 00
Horses.....number.....	30	125 00	3,750 00
Pelts.....do.....	3,000	50	1,500 00
Reapers.....do.....	147	100 00	14,700 00
Sheep.....do.....	74	2 50	185 00
Wagons.....do.....	300	80 00	24,000 00
Windowblinds.....do.....	600	4 00	2,400 00
Window-sash, lights.....do.....	15,000	6	900 00
Wool.....tons.....	5	650 00	3,250 00
Butter.....firkins.....	1,637	15 00	24,555 00
Hams.....casks.....	25	28 00	700 00
Leather.....rolls.....	25	40 00	1,000 00
Lumber.....M feet.....	24 $\frac{1}{4}$	15 00	364 23
Poultry.....coops.....	163	4 00	652 00
Merchandise.....boxes.....	386	80 00	30,880 00
Poultry, dressed.....cwt.....	150	10 00	1,500 00
Malt.....bags.....	128	2 00	256 00
Brooms.....dozen.....	150	2 50	375 00
Total value of merchandise forwarded, in trade, from Waukegan, by railroad, in 1855.....			179,922 69

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

B 8.

Statement of the amount of duties collected at the port of Waukegan, State of Illinois, on foreign merchandise, from January 1, 1855, to December 31, 1855, showing also the enrolled tonnage of this port on December 31, 1855, as appears on the records of the custom-house, and showing the number of arrivals and departures at the port of Waukegan, from March 1, 1855, to December 31, 1855.

Amount of duties received each month, from January 1, 1855, to December 31, 1855.....	None.
Enrolled tonnage, December 31, 1855.....	401 45
Number of schooners enrolled.....	3
Number of arrivals and departures at the port of Waukegan, from March 1, 1855, to December 31, 1855.....	1,840
Tonnage of vessels arriving and departing in said period.....	1,119,116
Average number of arrivals and departures daily in said period.....	6
Average amount of tonnage daily arriving and departing in said period.....	3,657

J. D. GRAHAM,
Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c ,
Chicago, December 31, 1855.

JAMES H. WHITE,
Deputy Collector for Waukegan, Illinois.

3.—KENOSHA HARBOR, WISCONSIN.

In relation to this harbor I beg leave to refer to the accompanying maps, viz:

Sheet G No. 10,* shewing the soundings at the entrance of this harbor and between the piers, which were made under my direction in July, 1854. Scale $\frac{1}{1200}$, or 100 feet to 1 inch.

Map G No. 30,† of the harbor of Kenosha, showing its condition and the extent of practicable improvements at a reasonable cost, which are desirable to increase its capacity as a roadstead and harbor of refuge for the benefit of the general commerce of the lakes; from an accurate triangulation and survey made under my direction, by assistant John R. Mayer, in December, 1855. Scale 200 feet to 1 inch, or $\frac{1}{2400}$.

For an account of the work done, during the year 1854, towards the improvement of this harbor, I cannot do better than to quote from my

* This map was forwarded to the bureau with my general report, No. 32, of August 19, 1854. A copy is herewith sent for the use of the engraver.

† This map is herewith rendered in duplicate; the original for the Topographical Bureau, and a copy, from the original notes of survey, for the engraver.

general report to the bureau (No. 73) of the 29th of April last, as follows, viz:

“The work done at this harbor during the past season (1854) was confined to repairs necessary to its preservation, and to the raising the timber work of both piers, in certain parts, so as to bring them to a height of full five feet above the level of the water surface, all in accordance, as far as the season would allow us to progress, with the approved plan communicated with your instructions of August 29 and September 19, 1854.

“The outer or eastern cribs of both the north and the south pier were built up, from the water level, to a height of five feet above that level. The exposed faces of the outer or lakeward crib of the north pier were defended by sheath piling from any undermining effect of the lake current; a part with square oak piles 12 by 12 inches, and the remaining part with oak piles 6 by 12 inches.

“Had the cribs been built originally with bottoms sufficiently open to allow the stone to settle down and occupy the place of the sand as fast as the latter was washed out and carried away, this sheath piling would have been unnecessary. The plan ordered for all crib work since I have been in command on this lake requires that the grillage (or latticed) bottoms of the cribs shall have interstices at least two inches greater than the greatest dimensions of the largest stones used within the cribs, so as to allow the stone to pass freely through and occupy the place of any sand or other soil that may be washed, by the force of the lake current, from underneath the pier work.

“A section ninety feet long on the north pier, and another one hundred feet long on the south pier, which were only four feet high above the water surface, have been raised an additional foot in height, bringing them to the established rule of ‘at least five feet above the water level.’

“There were put into the south pier thirty cords of gravel, under my direction, which, in addition to a large quantity put in under the approbation of the department, by the city authorities, seems, so far, to have measurably stopped the interstices between the pier timbers, which were previously great enough to allow the sand blown upon the piers to percolate freely through into the channel.* The water faces, where most open, were also sheathed.

“For a distance of three hundred and fifty feet, (in addition to sixty feet previously done,) plank piling of oak three inches thick have been driven, capped, and fastened, from the west end of the north pier (in a northwesterly direction) along the line A B C, as represented on map G No. 10. This has had the desired effect of preventing the water being driven, by the force of westerly winds, behind the north pier, so as to wash away the soil between that pier and the adjacent bluff shore.”

I will now mention the work done during the season of 1855 at this harbor, viz:

Portions of the north pier—where, from the effect of irregular set-

* My instructions to the agent, Mr. Hale, (see C 1,) required that this gravel should be combined with clay or stiff mud, as recommended by the Board of Engineers. This was not done by the agent. It would have more completely remedied the existing evil here. J. D. G.

ting, the timbers had been riven apart, the bolts started, and gaps formed between adjacent timbers—have been adjusted, and additional iron bolts driven. The docking, to guard the shore at the west end of the south pier, has been raised by bolting on additional timbers to a height of five feet above the water level.

A valuable horse-power pile-driver, with appliances attached for dredging, and a scow constructed so as to be conveniently used as a crane-scow or mud-scow, as occasion might demand—both of which vessels had been sunk on the breaking up of the ice last spring, and which were found to be covered by a great weight of mud and sand deposited upon them—were raised by applying powerful machinery for the purpose. They were thoroughly inspected, and being proved to be sound, they were repaired and thoroughly caulked, and rendered efficient for service again. In raising them the steam power of the dredge-boat was required.—(See C 3.)

The chief work done at this harbor during the year 1855, however, has been the deepening of the channel between the piers and on the bar by dredging, and the making of an accurate triangulation and survey of the harbor for the purpose of developing the further improvements that are practicable and which seem necessary for the benefit of the general lake commerce. The result of this survey is shown by the accompanying map G No. 30.

Previous to the commencement of the dredging, the United States steam dredge-boat had to be put in good working order, which required several weeks of active labor. Owing to these preparations, and the boisterous character of the season, (already alluded to in this report,) the dredging could not be commenced to advantage earlier than the 29th of May. It was continued, whenever the weather would permit, (Sundays only excepted,) between that date and the 17th of August, during which period there were but thirty-nine days suitable for the work, which resulted in raising and removing thirteen thousand six hundred cubic yards of earth from the channel and bar. The number of cubic yards removed by each day's work is given in the accompanying report of the steam engineer in charge, herewith presented, marked C 4.

The soil removed consisted chiefly of a mixture of stiff clay with sand, forming a very tough compact mass, which offered great resistance to the dredge-buckets, and compelled us to work at a low pressure of steam (from 25 to 30 pounds to the square inch) to prevent breaking the buckets. Even at this pressure the great resistance of the clay would often cause the buckets, instead of cutting into it, to slide empty over its surface. The trial was made of loading down the carriage frame to prevent the above-mentioned effect, but it was not successful. The whole round of buckets would collapse into an elliptical form sufficiently to raise the lower buckets enough to cause a sliding over the surface of the clay, or to reverse the buckets on their swivel rods as they met the clay. I will remark, that I consider the general plan and arrangement of this dredging machine (Howard's) to be excellent for working in sand or light soil, but it is susceptible of modifications which would greatly improve it for excavating clay and the

harder soils. The ingenious inventor will, no doubt, be able to make these improvements.

All the earth excavated by the United States steam dredge was deposited in scows having drop bottoms, and warped out and emptied into the lake, where there was a depth of five fathoms water, and where the littoral current was strong enough to waft it to the southward and prevent its being washed back into the harbor by the action of the sea during easterly winds.

Dredging to the amount of about eight thousand cubic yards was also done during this season, by the corporate authorities of Kenosha, by means of a steam scoop dredge, worked chiefly close along side of the north pier, and delivering the excavated soil, which was chiefly sand, upon the pier. It was afterwards taken away, at the expense of the city, in wheelbarrows, and distributed where required for grading. A portion of this sand was no doubt washed and blown back into the channel before it could be removed from the pier.

The result of this dredging was, that a depth of not less than twelve feet over the bar, and at the entrance between the piers, and a depth of not less than nine feet in the channel between the piers, was produced, as was ascertained by careful soundings made at the close of the work.

During the severe gales of August, which caused terrible destruction to shipping and human life on this lake, several vessels were saved, drawing as much as nine feet of water, by running boldly into this harbor, and came to a safe anchorage near the western end of the piers.

My desire was to have made a thorough survey of this harbor in August, immediately after finishing the dredging, but pressing demands upon my attention at other harbors, and by duties of a different nature, rendered it impossible. It had to be deferred until December, and the resulting map (G No. 30) shows that a deposit had taken place between the 16th of August and the 11th of December, which reduced the depth of water, for about one half the area between the piers, to as little as seven and eight feet. At this moment, from ten and a half to eleven feet is the most that can be carried over the bar off the entrance of this harbor, and not more than seven feet can be carried for about one-fourth the distance along the channel between the piers. Indeed, a close comparison of maps G 10 and G 30 shows that, notwithstanding the important but temporary amelioration of the harbor produced by the dredging and removal of twenty-one thousand six hundred cubic yards of soil from the bottom in the summer of this year, (1855,) the entrance over the bar is not in so good a condition now, (December, 1855,) as it was in July, 1854; and that, although the general or average depth between the piers is greater now than it was then, yet only about one foot more can be carried throughout the channel, between the piers, at this time, than could have been carried in July, 1854.

It behooves us to endeavor to ascertain under what controlling law it is that the effect of this large amount of dredging, done at a cost of one thousand seven hundred and seventy-six dollars and seventy-nine

cents* to the United States, besides what was expended by the city in doing its part, has been so soon destroyed to the extent shown on the map, and to try, in the further progress of the improvement, to adopt some means to counteract its effect.

The increased deposit upon the bar at the entrance of the harbor has, no doubt, in my mind, been caused in a great measure by the unusual proportion and force of the northeasterly and easterly winds which have prevailed during the year 1855. The frequent and violent gales from these quarters, mentioned more in detail in the part of this report which relates to the Waukegan breakwater, will serve to illustrate this.

The direction of the current from the northeastward, which wafts along the silt and deposits it where the lake waves receive the most resistance at the mouth of the harbor, is due to the relative strength of the two forces of which it is the resultant; and these are, first, the littoral or shore current habitually prevailing from the northward and running parallel with the lake shore; and, second, the occasional sea current, or direction of the waves from the broad expanse of the lake, whose direction and force are due to that of the winds. As the latter force is augmented proportionately more than the first, the more will the resultant, or axis of deposit for the silt, trend towards the mouth of the harbor, or to the direction corresponding to that of the piers. The first remedy, then, which suggests itself is to increase the first mentioned force, and thus change the direction of the resultant more towards the south.

We know, from observation, that the strength of this littoral current increases with the increased depth of water, or in proportion to the distance, measured perpendicularly, from the shore, lakeward. This first condition will then be obtained by increasing the length of the piers, as has already been recommended by the Board of Engineers, and approved, but which was not done, because the balance of appropriation on hand was inadequate to the work required.

But there is still another cause operating at this harbor continually to augment the bar at its entrance, which it will be easy to remove, and which should be the first step towards the improvement, and this is the length, or projection lakeward, which has been given to the three bridge wharfs, or pile wharfs, as shown on map G No. 30, immediately to leeward of the harbor piers. These are Elkin's, Hale & Ayers, and Durkee & Truesdell's wharfs. They run out from 780 to 830 feet from the shore lakeward, or 240 to 300 feet further into the lake than the United States south pier of the harbor projects. This is done in order that they may reach a sufficient depth of water for vessels of the largest class to lie afloat along side of them when loaded. But they are a serious nuisance to the harbor, because, intercepting the silt carried past the government piers, its deposit begins along the line of these wharfs, a certain distance out from shore, and in accumulating extends more and more towards the harbor entrance, until very soon a bar forms which obstructs that entrance, as is shown by the line or limit *a b c* on map G No. 30.

* Which, for 1,360 cubic yards, is thirteen cents and six-tenths of a mill per cubic yard.

Unless some legal check can be given to this building out of private wharves to an indefinite extent into the lake, it must at last destroy the harbor entrance altogether, because the further these sand bars (which are of their creation) extend out from the shore, the further will the wharves be extended, in order to reach deep water. They should be at once curtailed so as not to exceed the limits marked *d, e, f* on the map. They will then have a length of three hundred and sixty feet, (360 feet,) measured from the lake shore, which is ample for the accommodation of vessels in loading and unloading, and the necessary depth of water for them to lie afloat should be obtained and preserved by dredging. I would recommend that this condition be insisted on before any steps are taken to extend the present harbor piers, because, otherwise, there will be kept up a useless and absurd race between the private wharves and these costly government works, in order to determine which shall project furthest into the lake, and all at the expense of and detriment to the general commercial interests.

The shoaling of the water between the harbor piers, which has taken place since the finishing of the dredging in August last, is due to a cause very different from either of those above mentioned. It has not been owing to silt washed in through the mouth of the harbor and deposited in the channel, because this would have formed the shoal at the first point of resistance to the waves, holding the silt in suspension, that is to say, on or east of a line connecting the extremities of the piers. But we find, by reference to the map, that the eastern extremity of this shoal (as bounded by the curve of nine feet water) is full 170 feet within or west of such a line; and that it extends only 190 feet along the inner margin of the north pier, but 560 feet along that of the south pier. The question arises: What must be the direction of the force that would produce such a phase? It is evident, on a careful examination of the premises, that it must be perpendicular, or nearly so, to that direction, and that the sand forming this shoal has been blown, by the violent gales of wind which have occurred, from the beach *A, A, &c.*, (see map,) into the channel. The greater deposit of it near the south pier than that near the north pier is due to the shelving effect of the latter pier.

I have often witnessed, (and so have my predecessors in charge of these lake improvements,) during strong winds from the northward, clouds of sand carried in the air and deposited in showers at a certain distance to leeward.

To protect the channel between the piers from this deposit, board fences, and sometimes fences of brushwood, have been erected to a height of four or five feet along the north margin of the north pier. This has been found to mitigate the evil, but not to cure it entirely, for the reason that these fences were not made of sufficient height. It is difficult to sustain a board or brush fence more than four or five feet high, made in the common way, against the strong northerly winds which often blow here. It is, however, essential that a stable barrier at least fourteen feet high, should be erected along the exterior face of the north pier, in order to ward off these showers of sand blown from the beach by the north winds. Grass should also

be sown on a thin layer of soil spread over the sand beach, which would soon take root and spring up, and form a permanent and natural protection.

I would recommend that the barriers to be erected should consist of a line of *chevaux-de-frise*, 600 feet long, extending from the junction of the lake shore with the north pier along the north margin of that pier, to its western extremity. My reason for recommending this form of barrier is, that it will stand on a base so firm that the force of no wind will overturn it.

These *chevaux-de-frise* should be of the form and dimensions shown by the drawings on the accompanying sheet, marked G No. 31. It will there be seen that they are varied somewhat from the military *chevaux-de-frise* used for defending camps and passes from a sudden attack of cavalry. For our present purpose they are required to be of much greater altitude, and they need not be made in so expensive a manner as those above alluded to. Instead of the usual *frise* of square timber (four to six inches square,) passing, by means of mortises in the longitudinal stringer, diametrically through it, and crossing one another in pairs at right angles, we propose, for the sake of economy, and as fully answering our purpose, to make use of pine plank, eighteen feet long and three inches thick and one foot wide. Into these planks, at a distance of two feet above the middle point of their length, square holes are cut $6\frac{1}{10}$ inches square; so that when two of them are crossed at an angle of eighty degrees, one of the diagonals of each of these squares shall be horizontal and the other perpendicular to the horizon.—(See figure 1.)

The longitudinal stringer *a b*, figs. 2 and 3, consists of a piece of pine timber, six inches square and twelve feet long, placed so that one of the diagonals of a vertical section shall be horizontal, and the other perpendicular to the horizon.

These timbers are passed through the holes in the pine planks placed in pairs of two planks, with their broad sides in contact, and crossing each other at an angle of eighty degrees at the vertex and nadir.

The first pair of cross planks is placed one foot from the end of the longitudinal stringer, and the next pair is placed six feet two and a half inches from the first, measured from centre to centre. The same thing is done with regard to the next and each succeeding stringer throughout the series. The ends of the adjacent stringers are brought within five inches of contact, and are fastened together by means of an iron hook in one of them, which passes into an iron staple or eye in the other, as shown in fig. 5, sheet G No. 31.

The *chevaux-de-frise* thus constructed, being adjusted in line, and connected by the iron hooks and staples, the next step is to relieve the strain on the joints of the planks, at their crossings, by the braces *c d* and *e f*, (figs. 1 and 3,) which consist of pieces of plank three inches thick, nailed to the flat sides of the cross planks, both at top and bottom. Finally, the windward side of the whole line of *chevaux-de-frise* is boarded, from top to bottom, with common inch-thick boards placed close together so as to prevent the passage of sand, however fine, when borne along by the force of the wind.

A barrier thus formed of planks 18 feet long, and crossing at an

angle of eighty degrees, (80°), will have a perpendicular height of 13.8 feet, or, say, 13 feet $9\frac{1}{2}$ inches.*

I herewith submit an estimate, marked C 27, of the cost of such a barrier, six hundred (600) feet long and thirteen feet nine and a half inches (13 feet $9\frac{1}{2}$ inches) high, amounting to \$750.

This length corresponds to the distance, from the lake shore to the western extremity of the north pier of Kenosha harbor.

In my opinion, the erection of this barrier should be the first thing to be done in behalf of this harbor, and I believe that its cost could not be appropriated to so great an advantage in any other way.

In the survey of this harbor, made in December, 1855, of which the map G No. 30 is the result, I have been particular in embracing, with accuracy, the basin lying immediately west of the United States piers, together with the arm of it which extends to the north to within 230 feet (two hundred and thirty feet) of the lake shore, measured on the line B C. Also, the arm to the west, which, some distance up, takes the name of Pike creek, and is crossed by the Chicago and Milwaukie Lake Shore railroad at D.

The depth of water in these estuaries is shown by soundings expressed in feet and decimals, in small black figures. The larger figures, in pale ink, show the depth in feet to which a pole two inches in diameter was forced, by the strength of a man, into the mud at bottom. The experiment was made in order to ascertain the nature of the soil, and the facilities for deepening the water by dredging, so as to form a capacious anchorage, or land-locked roadstead and port of refuge for shipping generally, during times of severe storms, which are frequently so destructive on this lake.

The quantities indicated by these two sorts of characteristics being added together will show the depth of water that may be obtained at very little expense, by dredging in soft soil. Beyond this, the additional dredging necessary to obtain a depth of twelve feet, would be in sand, and a mixture of clay and sand. This portion would, however, be comparatively small. Such a harbor of refuge is greatly needed on this part of the lake coast, and the map referred to will show the facilities presented by nature for such a one at Kenosha. It was by taking refuge here that several vessels, bound from ports on Lake Erie to Chicago, were saved during the violent gales of August, 1855.

Some persons, in discussing the improvements required at this harbor, have suggested the idea of opening a new water communication from the lake to the harbor, by an excavation from the head of the northern arm at B, to the point C on the lake shore, under the impression that it would afford an easy entrance for vessels running

* There are many cases requiring such barriers against the drifting sand, where the force to be opposed would allow of the planks being crossed at an angle of sixty degrees. This would give a vertical height of 15.6 feet by using planks 18 feet long. Planks 16 feet long, crossed at an angle of sixty degrees, will give a vertical height of 13 feet $10\frac{1}{4}$ inches. If crossed at an angle of eighty degrees, the vertical height will be 12 feet three inches. If the planks are fourteen feet long, at sixty degrees crossing, the vertical height will be 12 feet $1\frac{1}{2}$ inch; at eighty degrees, it will be 10 feet $8\frac{2}{3}$ inches. Varying the angle of crossing will not change the cost. Reducing the length of the boards will diminish the expense only equal to the value of the 3-inch pine boards saved.

before the wind in a northeasterly gale. But such a scheme ought, in my opinion, scrupulously to be avoided. If an opening were made corresponding to such a direction, it would be very difficult and expensive, if not altogether impossible, to prevent its being soon filled up again by the direct deposit of sand brought by the littoral current from the north, and by every lake wave tending towards it. Any such additional communication would have to be defended from this deposit by piers, projecting into the lake, upon a line parallel, or very nearly so, to the present United States piers. No new facilities for reaching the harbor would therefore be added, but, on the contrary, the opening, while it lasted, would, in certain winds, create a current through the proposed roadstead, which would bring with it a deposit of sand, and thus injure it by diminishing its depth.

The improvement of the roadstead by dredging, as suggested, would tend greatly to benefit the commerce now extensively established among the several States whose shores are washed by this and the other great lakes having a navigable water communication with it. It would also prove of great national importance, should it ever become necessary, for the common defence of our country, to maintain an armed fleet upon this lake.

I will now proceed to present the estimates of cost of the other improvements suggested, namely:

The extension of the harbor piers.—In the report of the Board of Topographical Engineers for western rivers and lake harbors, of July 18, 1854, it is recommended that an addition of two hundred and ten (210) feet be made in the length of the north pier upon a direction of north $78^{\circ} 45'$ east, being a prolongation of the direction of the sections of it that have been most recently built. This distance is adopted as the multiple of seven cribs by a common length of thirty feet. It is also there recommended that the length of the south pier be increased 180 feet, (equal to six cribs, each 30 feet long,) “precisely in the prolongation of the south pier.” This we find by accurate survey—taking the section last constructed as the guide—would be on a course of north $83^{\circ} 25'$ east. The principles adopted for determining these relative lengths are, that the piers need not extend into the lake beyond the depth of twelve feet water, and that the extremity of the south pier shall be shelved or protected, by the greater length of the north pier, from catching the drift or sandy deposits borne by the prevailing winds from a northeast direction, and thus allow this drift to pass freely to the southward of the harbor entrance.

From a close observation of the *régime* of the currents, and their effect upon the harbor entrance here, I am satisfied that the principles laid down by the board for continuing the improvement are correct, and ought to be carried out. In conformity with them, I have only to recommend a slight modification in the minor details as follows, namely:

It will be seen by the models and drawings herewith presented and previously described, that the length adopted for the cribs on this lake is thirty-two feet, in lieu of thirty feet.* This was done because

* An exception was made in regard to the cribs for the breakwaters at Waukegan and Michigan city, because timber had previously been obtained there thirty feet long, and had to be used.

we found there would be economy from it in regard to timber. As many sticks of the greater length as of the lesser, it is found, can almost always be obtained of the required size from a tree, and this is the rule (within certain limits) which should govern the lengths of the cribs to be constructed.

I would recommend, then, that the north pier be extended seven cribs of 32 feet in length each, upon the course north $78^{\circ} 45'$ east, as given by the Board of Engineers, equal to 224 feet; and that the south pier be extended only four cribs of 32 feet in length each, upon the course north $83^{\circ} 25'$ east, as indicated by the board, equal to 128 feet.

These proposed extensions are projected upon the map G No. 30, in dotted lines. It will there be seen that they will bring the new extremities of both the piers tangent to a northeast line, or to the direction of the most violent winds, and thus produce the protection, by the north pier, designed by the Board of Topographical Engineers. The extremity of the south pier will thus reach the designated depth of twelve feet of water, while that of the north pier will be in fourteen feet of water, and will thus be washed by a stronger littoral current, capable of wafting the silt a greater distance to the southward than if that pier should terminate in twelve feet of water.

I will here remark, that the maximum depth of twelve feet, which seems to have been assumed by the board as the proper limit for the extension of the harbor piers on this lake, has been based upon the fact that no greater depth is necessary to float vessels of the greatest draught now navigating it. So far as this fact is concerned, the conclusion is, no doubt, a correct one; but, I would respectfully submit, there is another principle of still more importance involved in fixing the maximum depth to which the windward pier should be, in many places, extended out into the lake; and this is, that when it may be necessary to transcend that depth in order to reach a force of current great enough to cause the silt to be wafted to leeward of the leeward pier, it should be done. This principle, if adopted, would, in most of the cases coming under my observation on this lake, require the windward pier to be extended out to a depth of fifteen to eighteen feet, while the extent of the leeward pier might be limited to reaching a depth of ten or twelve feet. The force of the littoral current from the windward would then be sufficient to waft most of the silt past the harbor entrance, so as to diminish very much its deposit there, and to deepen the water at the termination of the leeward pier.

I herewith submit an estimate, marked C 28, of the cost of this proposed extension of the Kenosha piers, amounting to \$19,096 88.

The dredging on the bar off the harbor entrance, and between the United States harbor piers, to obtain a depth of 12 feet of water as far as the western extremity of those piers; thence, on a northwest direction, to form a channel in the basin 600 feet long by 160 feet wide, and 10 feet deep, as indicated by the dotted lines from E to F, on the map G No. 30.

This is a part of the improvement authorized by the approved report of the engineer board of July 18, 1854.—(See Senate document No. 1, executive, 33d Congress, 2d session, part 2, page 286.)

The dredging to restore a depth of 12 feet at the harbor entrance, and to give that depth between the United States piers, also, will involve the removal of—

Light sand, which has been deposited by the littoral current and by the wind blowing from the northward, over the sandy beach, 6,370 cubic yards.

A stiff mixture of clay and sand, 20,178 cubic yards.

To obtain a depth of 10 feet in the channel E F, will require the removal of—

Soft mud and sand, 11,318 cubic yards.

A harder mixture of clay and sand, 3,773 cubic yards.

I herewith submit an estimate of the cost of this dredging, marked C 29, amounting to \$8,464 80.

I would earnestly recommend that the deepening of this basin to 10 feet be extended throughout, as far as the bridge over Main street to the west, and as far as the foot-bridge G H (see map) to the north. This is, I think, indispensably necessary to afford a proper anchorage for the commerce of this port alone.

The piers here are only 160 feet apart, and the port has not the benefit of a navigable river, like the other lake ports, extending far enough beyond the piers to afford accommodation to the shipping. Hence, without this extension, at least, the shipping will always be cramped for anchorage room, very much to the injury of the commerce of the place, and excluding all reasonable accommodation to the general commerce of the lakes as a port of refuge from storms.

The dredging necessary for this purpose will be—

In soft mud, 67,615 cubic yards.

In sand, of ordinary consistency, 16,900 cubic yards.

In a harder mixture of clay and sand, 8,455 cubic yards.

The area of this roadstead would then be 59,536 square yards, equal to a square 244 yards long by 244 yards wide.

I herewith submit an estimate of the cost of this work, marked C 30, amounting to the sum of \$9,669 22.

The further extension of the capacity of this harbor, as a general roadstead, by dredging, so as to give a depth of 10 feet in the northern arm, (F H L B,) and the same, also, in that portion of the western arm (I K) included between the bridges on Main street and Grand street, will require the excavation and removal of—

Soft mud, 157,358 cubic yards.

Sand, of ordinary consistency, and a harder mixture of clay and sand, 37,690 cubic yards.

I present an estimate, marked C 31, of the cost of this additional work, amounting to \$20,066 34.

This additional dredging would increase the capacity of the roadstead and harbor, beyond the United States piers, to a total of 153,938 square yards, equal to an area of 770 yards long by, say, 200 yards wide, with a depth of not less than 10 feet of water.

It would be quite practicable to continue the improvement up Pike creek, to the point D, where it is crossed by the Chicago and Milwaukee railroad, so as to form a direct junction of the harbor with that railroad; but as this does not appear to be required for the security

and accommodation of the general commerce of the lakes, but is rather a matter of local interest, we do not feel called upon to present here an estimate of its cost.

A recapitulation of the estimates now presented for this harbor, in view of the accommodation of the local commerce, and also of the lake commerce generally, will stand thus, viz:

1. For the protection of the harbor from a deposit of the drifting sand blown across the piers into the channel; estimate C 27.....	\$750 00
2. For the extension of the harbor piers; estimate C 28	19,096 88
3. For dredging necessary to produce a depth of 12 feet of water over the bar, and between the United States piers, and also a depth of 10 feet in the proposed channel E F 600 feet long by 160 feet wide; estimate C 29.....	8,464 80
Total to complete the work now recommended by the Board of Engineers for the accommodation of the local commerce.....	28,311 68

Additional improvements now recommended to favorable consideration, as required for the accommodation and security of the general lake commerce:

6. For deepening the basin to 10 feet of water west of the United States piers; estimate C 30.....	\$9,669 22
7. For increasing the capacity of this basin by deepening its north and west arms to 10 feet of water; estimate C 31.....	20,066 34

Total required for the general commerce of the lakes....	29,735 56
Do. for the local commerce, as above.....	28,311 68

Grand total, both for the general and the local commerce.....	58,047 24
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Kenosha is a port of delivery for foreign importations, and there is a deputy collector for custom duties stationed here belonging to the Milwaukee district. There is a coast light-house here, which bears north $73^{\circ} 20'$ west, and distant 324 yards from the eastern extremity of the United States north pier.

The accompanying statement, marked C 32, shows the enrolled tonnage belonging at present to this port to consist of five schooners, amounting to 730 tons. It also shows that—

From March 1 to December 31, 1855, the number of arrivals and departures of vessels to and from this port was 2,012.

Total tonnage arriving and departing, 35,996.

Average number of arrivals and departures daily, 6.

Average daily tonnage arriving and departing employed in the port trade, 117.7.

The statement does not include the vessels which sought refuge here from storms during this period.

Owing to the operation of the recent reciprocal trade act in relation to the British provinces and the United States, there were no custom duties collected at this port during the year 1855.

The accompanying statements, marked C 33 and C 34, show the value of the commerce of this port, for the year 1855, was as follows, viz:

Imports.....	\$2,547,668 48
Exports.....	2,460,267 00
Total value of the commerce of Kenosha for the year 1855.....	5,007,935 48

These amounts are derived from a careful examination of the custom-house records, and the warehouse and mercantile books of this place.

The balance of the appropriation for the improvement of this harbor, including the proceeds of the sale of machinery, tools, and other property appertaining thereto, has been expended in the repairs and dredging given in detail above, except the small sum of \$51 39, which will be exhausted in completing the survey of the harbor.

At the conclusion of the work at this harbor, in September last, a portion of the United States property was seized by the corporate authorities of the city, under a writ of replevin obtained from the circuit court for the county of Kenosha, and it was for a time wrested from my custody. On the fact being communicated to me, I felt it to be my duty to repair to Kenosha and demand its speedy restitution. The history of the transaction and of the circumstances connected with it is presented in the accompanying documents, marked from C 5 to C 25, inclusive.

The ground at first taken by some of the members of the common council, in justification of the proceeding, was, that the said body was a *bona fide* proprietor in the property, arising from the pecuniary expenditures which it had made in repairing it. Finding that these persons asserted the same right in regard to the United States harbor piers at this place, and claimed that, inasmuch as the corporate authorities had expended money in their repair, it was a joint owner with the United States of those piers, and, therefore, possessed a legal right to use them for corporation purposes, and to enter upon them and repair them in such manner as it might deem to be proper, and this without any control of the United States officer in charge, I felt it to be my duty to issue the regulation herewith presented, marked C 26.

Any such practice as is prohibited by this regulation, which is in accord with the rules laid down by the War Department, would completely subvert the system of improvement recommended by the Board of Engineers and adopted by the department. It would, moreover, render these public works subservient to a mere local interest, rather than to that of the general commerce of the country, for which they are especially constructed.

C 1.

Colonel Graham's instructions to Agent Samuel Hale.

OFFICE GENERAL SUPERINTENDENCE,
LAKE MICHIGAN WORKS,
Chicago, September 23, 1854.

SIR: You will immediately form a working party and proceed to execute the following work, required to be done under instructions which I have received from Washington, viz:

1. You will fill in behind the sheath piling and inside of the piers from C to D, and from E to F, (see accompanying drawing,) to keep the sand from washing into the channel, or so much thereof as has not already been done by the city authorities. This filling must be done with a mixture of coarse gravel and clay, if clay can be conveniently procured, otherwise stiff mud must, by the direction of the Board of Engineers, be combined with the gravel. The gravel must be coarse enough not to pass through the interstices that may exist into the river.

2. You will build up the two outer cribs, that is to say, the one at the east end of the north pier and the one at the east end of the south pier, to a level of 5 feet above the surface of the lake.

You will report without delay how much of the filling in within the spaces specified has been done by the city authorities, and how much remains to be done. The building up at the ends of the piers, as specified, is to be commenced immediately as well as the other work specified. You will make weekly reports to this office of your progress.

I herewith enclose to you a draft on the United States depository at this place for three hundred dollars, to pay mechanics and laborers, for which you will please sign and return the accompanying duplicate receipts.

I am awaiting instructions from Washington in regard to the further sheath piling and further levelling up of the piers to five feet above the water surface.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieut. Col., Sup'g Eng., &c.

SAMUEL HALE, Esq.,
United States agent, Kenosha, Wisconsin.

C 2.

Colonel Graham's further instructions to Agent S. Hale.

OFFICE GENERAL SUPERINTENDENCE,
LAKE MICHIGAN WORKS,
Chicago, September 27, 1854.

SIR: In accordance with additional instructions I have this day received from Washington, the following work will be executed for

Kenosha harbor, being in compliance with my recommendations to the Bureau of Topographical Engineers, viz:

1. Besides the building up of the outer cribs of the north and south piers to a height of five feet above the water level, as you were instructed on the 23d instant, you will protect the exposed faces of those cribs, (at their extreme ends, and on the faces that have dipped,) with good sheath piling of oak plank at least four inches thick, to be driven deep into the soil at the bottom of the lake until firm resistance is met, and close together, with a view to forming joints that will not allow of the escape of sand by the action of the lake current.

This must be extended so far inward or *westward* as to close well the joint with the next preceding crib, should you find either of these joints to be at all open.

2. You will, by similar sheath piling, close up the open joints at these points in both piers which were designated when I inspected the piers at the end of June last.

3. You will make a thorough examination all along both piers, with a view to ascertain if there are other places along the river faces of these piers which require sheath piling to prevent the oozing out of any material with which the interior of the crib work has been filled. Wherever you find this to be the case, you will stop the passage of such matter into the river by sheath piling of oak plank three inches thick, driven close together so as to make close joints.

You will, as soon as this inspection is made, report to this office what extent of piling under this head will be required, but will not delay its progress.

Your full pay as agent will be resumed from the day that your working party commences actual work.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer, &c., &c.

SAMUEL HALE, Esq.,

United States agent, Kenosha, Wisconsin.

C 3.

Colonel Graham to Mr. Charles Myers, steam engineer of the United States dredge-boat.

OFFICE GENERAL SUPERINTENDENCE,

Chicago, September 3, 1855.

SIR: You will lay the United States steam dredge in such position as Mr. Millar may require, and operate the engine and the scows in such way as he may desire, as assistance in endeavoring to raise the United States pile-driver and other sunken property at Kenosha.

J. D. GRAHAM,

Lieut. Col., Superintending Engineer.

Mr. CHARLES MYERS,

United States steam dredge, Kenosha, Wisconsin.

C 4.

Report to Colonel Graham, from Mr. Charles Myers, steam engineer.

KENOSHA, August 17, 1855.

SIR: In obedience to your directions, I give you herewith a statement of the number of days' work performed at Kenosha with the United States steam dredge, also the amount of earth removed, between May 29, 1855, and August 17, 1855, when the work was discontinued.

Date.	Number of scow loads.	Cubic yards.	Date.	Number of scow loads.	Cubic yards.
May 29.....	22	440	July 14.....	20	400
30.....	26	520	16.....	14	280
31.....	24	480	17.....	16	320
June 4.....	20	400	18.....	15	300
5.....	18	360	19.....	10	200
6.....	24	480	25.....	10	200
8.....	20	400	26.....	14	280
9.....	12	240	28.....	10	200
12.....	25	500	31.....	18	360
13.....	20	400	Aug. 1.....	20	400
14.....	21	420	2.....	18	360
20.....	15	300	3.....	22	440
21.....	19	380	7.....	12	240
22.....	26	520	9.....	15	300
23.....	24	480	13.....	12	240
28.....	20	400	14.....	8	160
29.....	16	320	15.....	9	180
July 2.....	18	360	16.....	10	200
6.....	14	280			
10.....	15	300			
11.....	28	560	Total.....	680	13,600

I am, respectfully, your obedient servant,

C. MYERS,

Steam Engineer to the U. S. dredge at Kenosha, Wisconsin

Colonel J. D. GRAHAM,

Superintending Engineer of Lake Michigan Works.

C 5.

Colonel Graham to Colonel Abert.

[No. 102.]

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, October 6, 1855.

SIR: I sat down the first of September to make out my annual report to the topographical bureau agreeably to regulations, and it would have been completed and forwarded long since but for repeated and almost continual interruptions, beyond my power to prevent, at the same time that they involved a superior obligation on my part to give

my personal attention to the efforts that became necessary to try to save a large amount of public property at Kenosha and Waukegan from total loss, from the violent storms that have prevailed on this lake a great portion of the time since the 1st ultimo, and from the condition in which that at Kenosha was left by the late agent, and, more recently, from a most extraordinary and, as I conceive, inexcusable attempt on the part of the mayor and common council of the city of Kenosha to sequester, by unlawful seizure, a valuable portion of the United States property at that place. The nature of this last-mentioned transaction will fully appear by a perusal of the documents herewith presented, marked from C 6 to C 25, inclusive.

Fortunately I was enabled to frustrate this attempt, but it has caused serious interruption to the public interest.

On the night of the 2d instant I was enabled to leave Kenosha and return here to resume the regular course of my duties. My report will now be resumed and completed, and forwarded to you as soon as practicable.

The names of the members of the common council of Kenosha who instigated the measures which led to the seizure of the United States horse-power pile-drive and crane scow, and all their appurtenances, are—

Charles C. Sholes, *mayor*;

Sheldon Fish, David Crossit, Reuben H. Deming, (who is also a notary public,) *aldermen, or members of the common council*.

Enoch W. Evans is the attorney for the common council, and was active in the matter.

The affidavit and writ of replevin were procured at the instigation of the persons above named, without any previous authority or formal order of the common council, although, as will be seen by my correspondence with that body, it afterwards endorsed, and, for a time, justified and defended the measure.

If this extraordinary measure on the part of the mayor and common council of Kenosha be overlooked by the government, I fear the officers of that government stationed in that quarter will be but illy able, hereafter, to sustain its dignity and its rights committed to their custody. Whatever of lenity may be due to the final recantation of the act and surrender of the property had, perhaps, better be adjudged by the proper legal tribunal upon a trial of the case, and the exercise of Executive clemency, if adjudged advisable.

In regard to the individual Sheldon Fish, independent of the responsibilities resting upon him in common with the other members of the council, above named, he was guilty, and should be separately charged with having, on the 27th September, 1855, forcibly and feloniously entered upon the United States steam dredge, then lying at the United States south pier of Kenosha harbor, and with having abstracted from her, with the aid of a party of men employed by him for that purpose, one iron pile-driving hammer, one iron scoop or dredge-bucket, three pieces of iron chain, and sundry other articles, the property of the United States. The facts, in detail, in regard to this act of Sheldon Fish, are, as appears from my investigations made the next day, as follows, viz :

The pile-driver and crane scow were lying attached alongside of the *north* pier, ready to be taken in tow by a steamer hourly expected to call and take them, together with the four other scows belonging to the steam dredge, to Chicago. The steam dredge lay alongside the *south* pier for the purpose of taking in coal for the trip, as she, also, was to accompany the steamer to Chicago.

The sheriff proceeded first to seize a pile-driver hammer and scoop-bucket belonging to the United States. He, and Sheldon Fish, and a party of men who were at work for the city corporation, went forcibly on board the United States steam dredge-boat, and forcibly wrested from the said boat, and from the custody of Charles Myers, the steam engineer and regularly appointed custodian, the pile-driver hammer, weighing about two thousand pounds, and the iron scoop-bucket, and put them on shore. Mr. Myers protested, to the sheriff, against this act, and forbade Fish to touch the articles. Fish laid violent hands on Mr. Myers to effect his purpose; and when Mr. Myers attempted, by his own personal force, to resist Fish, Sheriff Ehle put his hands on Mr. Myers and ordered him to be quiet. All this time the parties were all on the deck of the United States steam dredge-boat, afloat alongside of the United States south pier. The only crew then attached to the United States dredge-boat consisted of Mr. Myers and two or three men, who would have made an effort to repel Fish and his party, but that the latter consisted of about three times their number, backed by the authority of the sheriff, according to Mr. Myers' account of the matter to me.

After the sheriff had acted thus, he crossed to the north side of the river, and he seized the crane scow and the pile-driver. He caused them to be unfastened from their moorings and taken to a place higher up on the north pier and made fast, under the surveillance of the large party of men who were at work for the city near by.

Here Fish and another man were put on board these vessels by the sheriff, with orders to hold them, and to resist any person who might attempt to take them. In this situation I found them the 28th of September, when I went to see after them.

Fish is the member of the common council alluded to in my letter to that body of the 29th of September, (hereto attached, marked C 22,) as having been over active in this matter, and as having attempted to tamper with one of my assistants, (Mr. Millar,) in asking him to wink at Fish's attempt to use the public property improperly.

In order to ascertain distinctly from the sheriff how far he endorsed Fish's act on board the United States dredge-boat, I questioned him particularly on the subject. The sheriff declared to me, in the presence of another witness, that he did not call on Fish to go on board the dredge-boat with him, and intimated clearly that what Fish did there was on his own responsibility, and not the sheriff's. When I demanded of the sheriff to know why it was that he laid his hands on Mr. Myers, when the latter attempted to repel Fish from the vessel, the reply was that he only exercised his authority to keep the peace between them, and did not take sides with either.

In conclusion, I recommend, for the future security of the public property under my charge, that the offenders in this case be at once

prosecuted, and that the necessary instructions be given from the Attorney General's office to the United States attorney for the district of Wisconsin to that effect. If delayed, it may become difficult to find the witnesses, who are now near by, but being mechanics, who sometimes change their residence as business demands, they may not be so easily found at a distant future time.

In the cases of trespass heretofore reported from this office and recommended for prosecution, in relation to the United States piers at Chicago, no instructions were received by the United States attorney for this district from the office of the Attorney General at Washington.

For this reason those acts have gone unpunished, and this has increased the difficulty attending my enforcement of the government regulations here. I will remark, however, that since that period no trespasses of grave importance have occurred at Chicago.

It became known that the War Department had sustained my recommendations for actions against the offenders, and even that has had the effect of making them and others more circumspect. The Kenosha cases are, however, far more grave than anything that has ever occurred elsewhere, to my knowledge.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj. T. E., Brevet Lieut. Col., Superint. Eng.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

C 6.

Colonel Graham to Assistant R. M. Millar.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, September 20, 1855.

Sir: On my return here this afternoon from Waukegan, whither I was obliged to go to see to the care of the public property there during the late severe storm, I received your letter in relation to the pile-hammer. It, together with the scoop-bucket, must be retained on board the United States steam dredge until they and the pile-driver shall arrive here. You and Mr. Myers will please have all the United States scows (five in number) ready to be towed here at a moment's warning. The city authorities of Chicago will engage a steamer to tow them here immediately, so that we may go to work at once to dredge a channel through the bar near the north pier. The United States dredge will come along in company with them, and also the horse-dredge and pile-driver, if ready, which I hope is the case. No offer having been made for it elsewhere, it must come here.

J. D. GRAHAM,

Lieut. Col., Superintending Engineer.

Mr. ROBERT M. MILLAR,

Kenosha, Wisconsin.

C 7.

Mr. C. C. Sholes, Mayor of Kenosha, to Colonel Graham.

KENOSHA, *September 20, 1855.*

SIR: We had the misfortune to lose our city dredge a few nights since. It was destroyed by fire; the engine, boiler, &c., are sunk in seven feet water. We are anxious to raise and secure them. To do this, we desire the use, a short time, of the government horse-dredge and scow. Can we have them, and if so, on what terms per diem? Please answer.

We shall put the iron bucket, or scoop, referred to in your late communication, in good order.

I was not aware it was injured, or measures would have been taken, before now, for its repair.

I have the honor to be, yours, with great respect,

C. C. SHOLES,
Mayor of Kenosha.

Lieut. Col. J. D. GRAHAM.

C 8.

Colonel Graham to Mr. Sholes.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, September 22, 1855.

SIR: Your letter of the 20th instant is received. I regret very much the misfortune which has happened to the city of Kenosha in the loss of your dredge by fire. I would very cheerfully tender the use of the United States vessels and scows to aid in raising the boiler and engine, but that I had previously made the necessary arrangements for having them all brought immediately here. I am not authorized to hire any of these articles, but am required to sell the horse pile-driver and mud-scow that were sunk, with all their appurtenances, which I am bound to do without further loss of time, as the season for their use is nearly over for this year. Should the city authorities desire to purchase them, they shall be put at a very reasonable price, to be assessed by competent judges. I am required to sell them at once, to cover expenses already incurred in your harbor improvement.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer, &c.

C. C. SHOLES, Esq.,

Mayor of Kenosha, Wisconsin.

C 9.

Colonel Graham to Assistant Robert M. Millar.

OFFICE OF GENERAL SUPERINTENDENCE.

SIR: I have received your letters of the 20th and 21st instant; also the joint report of yourself and Mr. Myers, of the 20th. The horse pile-driver and scows, being all now afloat, will be brought here immediately, unless the city authorities of Kenosha should desire to purchase the pile-driver and its appurtenances, and the scow lately sunk and raised, either or both. You will please ascertain, and if so, you and Mr. Myers are authorized to appraise them at a price you may consider reasonable, and report it for my approval. The mayor has written to me, asking the privilege of hiring them for use in raising some of their sunken machinery belonging to their city dredge. I am not authorized to hire them, but I would cheerfully tender their use, but that I cannot take any other steps than to sell them now, for which special object they have been repaired at considerable cost. You will please to explain this to the city authorities, so that they may fully understand.

I have received the receipt you forwarded, which Mr. Myers had. The blocks, &c., shall be looked to on Monday.

Mr. Emerson received the iron which you shipped to him; all safely arrived before the violent storm.

I am, very respectfully,

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer.

Mr. ROBERT M. MILLAR,

Kenosha, Wisconsin.

C 10.

C. C. Sholes, Mayor of Kenosha, to Colonel Graham.

[By Telegraph from Kenosha to Chicago.]

KENOSHA, *September 24, 1855.*

We will buy the horse pile-driver and mud-scows, with all the appurtenances, at such price as three disinterested men may determine; you to select one, we another, and these two a third. Will you consent to this? If so, please name your man, and let us have the matter settled at once, as we require the use of the scows immediately. Answer this afternoon by telegraph.

C. C. SHOLES, *Mayor.*

Colonel GRAHAM, *Chicago.*

N. B. Colonel Graham's answer to the above, by mail, stated to the mayor of Kenosha that Colonel Graham could not, under the govern-

ment regulations, adopt the mode of appraisement suggested by the mayor, and that Colonel Graham had already appointed a board of survey for that purpose, who were then performing the duty; that they would report their proceedings for Colonel Graham's approval, &c. The pressing haste prevented my preserving a copy of this letter to the mayor. It was mailed on the evening of September 24. A copy will be got and forwarded hereafter. J. D. G.

C 11.

Assistant R. M. Millar to Colonel Graham.

KENOSHA, September 25, 1855.

SIR: Your letter of the 22d instant is received. I went immediately to make inquiry whether the city authorities wished to purchase the pile-driver and scow. The mayor (Mr. Sholes) informed me that he had telegraphed to you in relation to them. I was present at the office when he received your answer that you would answer by mail to-day.

As to the appraisal of the property aforesaid, Mr. Myers and myself are of the impression that, under all circumstances and present condition, they should be worth at least half their original cost, considering them in the condition of being half worn.

On the returns I perceive the pile-driver is rated at \$1,500, and the crane scow at \$250—total \$1,750; consequently they should be worth at least \$800 in their present condition, with their appurtenances.

I am, very respectfully, your obedient servant,

R. M. MILLAR.

Colonel J. D. GRAHAM,

Superintending Engineer, Lake Michigan Works.

C 12.

C. C. Sholes, Mayor of Kenosha, to Colonel Graham.

[By Telegraph from Kenosha to Chicago.]

KENOSHA, September 26, 1855.

I am authorized to offer \$500 for the horse pile-driver, scows, and appurtenances.

C. C. SHOLES, *Mayor.*

Lieutenant Colonel J. D. GRAHAM, *Chicago.*

Ex. Doc. 16—11

C 13.

Colonel Graham to Mr. Sholes, Mayor of Kenosha.

[By Telegraph from Chicago to Kenosha.]

CHICAGO, *September 26, 1855.*

I cannot accept your offer of \$500. It is too little. The appraisement has been put low, I think, at \$800; I can get that sum here readily. The pile-hammer and scoop would cost, alone, about \$180 to \$200, and the vessels are surely worth \$600 at a low valuation, being newly caulked.

J. D. GRAHAM,
Lieutenant Colonel.

C. C. SHOLES, Esq.,
Mayor of Kenosha, Wisconsin.

C 14.

Colonel Graham to Assistant Millar.

[By Telegraph from Chicago to Kenosha.]

CHICAGO, *September 26, 1855.*

The "Keystone State" steamer will probably call at Kenosha early to-morrow morning, to tow down our scows. Be ready for her, so as not to detain her. If the council do not wish to buy the pile-driver and scow at the appraisement, bring them here, if the steamer can bring all at once, and let the steam dredge take in coal and come here immediately.

J. D. GRAHAM,
Lieutenant Colonel.

ROBERT M. MILLAR, Esq.,
City Hotel, Kenosha, Wisconsin.

C 15.

Mr. Millar to Colonel Graham.

[By Telegraph.]

KENOSHA, *September 27, 1855.*

Your presence is required here. Please come up in this afternoon's train.

R. M. MILLAR.

C 16.

Attorney Evans to the sheriff of Kenosha county, Wisconsin.

STATE OF WISCONSIN, }
Kenosha county, } ss.

THE CITY OF KENOSHA, }
vs. } *Of the November term of the Kenosha county*
ROBERT M. MILLAR. } *Circuit Court, A. D. 1855.*

MR. CLERK: Issue a writ of replevin on the affidavit filed in the above entitled suit, returnable as above.

E. W. EVANS,
Attorney for plaintiff.

KENOSHA, September 27, 1855.

C 17.

Affidavit of Andrew Leonard.

STATE OF WISCONSIN, }
Kenosha County, } ss.

Andrew Leonard, being duly sworn, on oath, deposes and says: That the city of Kenosha is now lawfully entitled to the possession of one horse power pile-driver and the tackle thereunto belonging, and one common scow boat with crane, which said property is of the value of five hundred dollars; that the said pile-driver and scow boat are unjustly detained by one Robert M. Millar; that the same has not been taken for any tax levied by virtue of any law of this State, nor seized under any execution or attachment against the goods and chattels of the said city of Kenosha; that this affidavit is made in behalf of the said city of Kenosha, whose agent affiant now is, and is made to obtain a writ of replevin from the circuit court of Kenosha county aforesaid, in which said writ the said city of Kenosha is to be plaintiff, and said Robert M. Millar is to be defendant; and further deponent saith not.

ANDREW LEONARD.

Subscribed and sworn before me, this 27th of September, A. D. 1855.

REUBEN H. DEMING,
Notary Public, residing in Kenosha county.

STATE OF WISCONSIN, }
Kenosha county, } ss.

I, Lansing B. Nichols, clerk of the circuit court for the county of Kenosha, in the State aforesaid, do hereby certify that the foregoing is a true copy of a precept and affidavit on file in my office, in the case of "The City of Kenosha vs. Robert M. Millar," (and that the erasure of the name of "Charles S. Sholes," as appears in the copy, and the

substitution of "Andrew Leonard," is a correct transcript of the original affidavit on file,) and of the whole of said precept and affidavit.

In testimony whereof, I have hereunto set my hand and the seal of
[L. S.] said court, this 28th day of September, A. D. 1855, at the city
of Kenosha, in said county.

L. B. NICHOLS, *Clerk.*
Per S. Y. BRANDE,
Deputy Clerk.

C 18.

*Writ of replevin under which the United States property was seized at
Kenosha, Wisconsin.*

STATE OF WISCONSIN, }
Circuit Court for the County of Kenosha, } ss.

*The State of Wisconsin, to the Sheriff of the County of Kenosha—
greeting:*

Whereas the city of Kenosha complains that Robert M. Millar does unjustly detain one horse power pile-driver and one common scow boat with crane, of the value of five hundred dollars: Therefore, you are commanded, that if the said city of Kenosha shall give you security, as required by law, to prosecute his said complaint, and to return the aforesaid goods and chattels, if return thereof shall be adjudged, and to pay all such sums of money as may be recovered against him hereupon, that you cause the same goods and chattels to be replevied and delivered to the said city of Kenosha without delay; and also, that you summons the said Robert M. Millar to appear before the judge of the circuit court, at the court-house in the city of Kenosha, on the second Monday of November next, to answer the said city of Kenosha in the premises.

Witness, the Hon. James R. Doolittle, judge of the first judicial circuit of said State, at Kenosha, the 27th day of September, in the year of our Lord one thousand eight hundred and fifty-five.

L. B. NICHOLS, *Clerk.*

E. W. EVANS, *Attorney for Plaintiff.*

C 19.

*Col. Graham to the Mayor and Common Council of the city of Kenosha,
Wisconsin.*

KENOSHA, WISCONSIN, *September 28, 1855.*

To the Mayor and Common Council of the city of Kenosha:

I find, on my arrival here to-day, that several articles of United States property which are committed to my custody by the United

States have, at the instance of the mayor and common council of the city of Kenosha, been forcibly wrested from my said custody and that of my lawful agent, Charles Myers, under the pretence of an oath or affidavit made by Andrew Leonard, that the city of Kenosha is lawfully entitled to said articles, and that they were unjustly detained by one Robert M. Millar; the affiant representing himself as the agent acting for the said city of Kenosha. The articles thus seized by this unlawful process and at the instigation of several individuals of your body, now known to me, are the horse power pile-driver and its appurtenances and a crane scow and its appurtenances.

It cannot but be known, I suppose, to your body, that these articles belong solely to the United States, and that as such no one except myself or my duly appointed agent has a right to interfere with them. I am fully warranted in saying this, from the correspondence which has but recently transpired between me and the mayor of Kenosha, in which propositions were made to me to hire the use of these articles for the said city, and afterwards for their purchase upon terms which were rejected by me as inadequate.

The detention of these articles has already been detrimental to the public service, and I now, in behalf of the United States of America, protest against their further detention, and demand their prompt restitution to my possession and custody by the mayor and common council of the city of Kenosha, under the pains and penalties of the laws of the United States in case of your failure in the premises.

JAMES D. GRAHAM,

Lieutenant Colonel, Superintending Engineer, &c.

C 20.

The Mayor of Kenosha to Colonel Graham.

KENOSHA, WISCONSIN,
September 28, 1855.

SIR: I have the honor to acknowledge the reception of your note in reference to certain property which you allege has been forcibly wrested from your custody, and demanding, in behalf of the United States of America, the restitution of said property to your possession.

I shall take occasion to call a meeting of the city council at an early hour to-morrow a. m., to consider the subject-matter of your communication, and shall immediately thereafter make such reply to the demand made as may be directed.

Yours, very respectfully,

C. C. SHOLES,
Mayor of Kenosha.

J. D. GRAHAM, *Lieutenant Colonel, &c.*

O 21.

The Mayor of Kenosha to Colonel Graham.

KENOSHA, September 29, 1855.

SIR: In accordance with a special call, a meeting of the council of this city was held this morning. Your communication of last evening was submitted and considered. I am directed to make the following reply:

The property in question has been legally taken, and is legally held, under process duly issued and served in accordance with a statute of this State. Concerning the legal merits of the case, any statements or arguments are at present, perhaps, unnecessary. When the matter comes up for adjudication, our grounds of action will be fully presented and argued, and it will be for the court to decide as to their sufficiency. The party you represent is fully secured in the mean time from loss or damage, should it be made to appear, as contended by you, that the process is *unlawful*, and the property replevied is *unjustly detained*.

In the correspondence between you and myself alluded to, our object was simply to obviate difficulty, the city being willing to waive its rights, if the pile-driver, &c., could be retained for use in this harbor by hire, or even purchase, at what could be considered a fair price. This position the city still occupies.

Without meaning the slightest disrespect to your authority, or to that of the government whose interests you represent, but for the reason solely that the city which I represent has legal rights in the premises worthy of being tested and maintained, I am directed to say that the demand formally presented by you, cannot, under existing circumstances, be consistently complied with or acceded to.

Respectfully, yours,

C. C. SHOLES, *Mayor,*
in behalf of the city council.

J. D. GRAHAM, *Lieutenant Colonel, &c.*

C 22.

Colonel Graham to the Mayor and Common Council of Kenosha.

GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Kenosha, Wisconsin, September 29, 1855.

I have received the letter of the mayor of Kenosha of this date, in reply to my demand of yesterday for the speedy restoration to my custody of the articles forcibly seized on the 27th instant, and withheld from it at your instigation. It is with no less surprise than regret that I find the disposition indicated by your body to persist in the outrage which you have committed against the dignity and right

of the United States. I was in hopes, upon the facts brought to your attention by my letter of yesterday, and upon a deliberate review of your proceedings, you would have hastened to repair it, and thus have saved your city from the damages, and those of your body who instigated the proceedings from the grave penalties, which you ought to be aware must be the result of a prosecution at law.

Since my letter to you of yesterday, I have investigated still further than I had an opportunity to do previously the circumstances attending this extraordinary transaction, and especially as to how it came to pass that the affiant, whose oath produced the writ, was substituted in the place of Charles C. Sholes, whose name appears, under an erasure of the pen, as the affiant originally intended. I am prepared to show that he who was thus substituted and induced to come forward and take the oath is an uneducated man, unacquainted with laws, and would not have taken the steps he did if left alone; that he was ignorant of the true nature of the issue, and did not even know and had never seen Robert M. Millar at the time he took the oath that the said Millar unjustly detained the property. The extraordinary ground assumed in this proceeding seems to have been, that money appropriated by Congress for the improvement of a harbor, or property acquired by means of such appropriation in aid of such improvement, becomes the property of the town or corporation that happens to be located where the improvement is to be made. Nothing can be more fallacious than such a doctrine. Such appropriations are made, and can only be applied, for the benefit of the general commerce of the United States, being for the security and accommodation of vessels belonging to any and every part of the United States likely to be in need of such security or accommodations, from New Orleans, or the extreme south, to the utmost limits of the north or east. As well might the corporate authorities of the cities of New Orleans, Savannah, Charleston, Baltimore, Philadelphia, New York, or any of the cities situated on any of our great lakes, undertake to claim and seize this property as for Kenosha to do so. Kenosha is but a small, and like each of the other cities, but an integral part of that great commerce for whose benefit the appropriation for the improvement of Kenosha harbor is made; and this is the general principle and purview of the law in regard to each and every harbor thus appropriated for throughout the Union. And yet when I demanded of the affiant the grounds upon which he swore, in order to make them known to the proper department, he declared, in the presence of three witnesses, that he believed the property to belong to Kenosha, because the appropriation out of which it was acquired was made for Kenosha. As well might your body undertake or claim the right to replevy upon the United States light-house and its appurtenances, or the property belonging to the custom-house, or upon the United States ship-of-war Michigan, or her guns, or tackle, were she lying in this port, as to do what you have done. But you cannot lawfully do either, and to do either is an act of violence no greater in the eyes of the law than what you have done.

These are principles so clear to a civilian as intelligent as Charles C. Sholes, that I presume it would have been impossible for him to

have brought his mind to take the oath necessary to the issuing of the writ; but to the mind of the unlettered individual who was induced to become his substitute, as appears by the files of the court, at the same time that no one enlightened him on these principles, it may well be understood the matter was by no means clear. As I remarked before, he did not know and had never seen the man who he swore was unjustly detaining the property. Now, I assert, and shall be bound to take the ground, that there is no truth in the oath as it stands, taken by a man who was induced to do it, not intending doubtless to do wrong, but without any knowledge of the important facts in the case. I say there is no truth in the oath as it stands. Mr. Millar had nothing to do with the detention of the property. The property was under the custody of Charles Myers, regularly appointed by authority of the War Department, and it was wrested from the custody of Myers and not Millar. Mr. Millar was my assistant for the raising of the property where it lay sunk under water and in repairing it, but the whole was in the custody of Myers in my absence. I trust your body will yet reflect upon this matter with a view to retracing and amending your steps. You ought to be aware that such a proceeding as this for the purpose of getting hold of the government property cannot be sustained in the face of that high tribunal, before which, under a late law of Congress, the actions which must ensue, unless this property be speedily released to my custody, will have to be tried. In my investigations I have further ascertained that, before the swearing was obtained, which procured the writ, one of your body, who has been over active in this matter, and in aiding and abetting the forcible entry upon the United States steam dredge and abstracting the public property from it, attempted to tamper with one of my assistants, by asking him to leave the dredge-boat (where he had a full view of the horse power pile-driver and the crane scow) and to go up town and wink, while he, the said member of your body, should go and take possession of this property and use it in raising your engine, &c., which were sunk by the burning of your machine. On the indignation expressed at such a proceeding, and the refusal to listen to the proposition by my said assistant, it was that the said member of your body went away, and forthwith the proceedings took place which led to the violent and unlawful seizure. This attempt on the part of your said member, which was frustrated by my faithful assistant, makes it my duty to warn you, as I hereby do, not to use or attempt to use this property while it is held in durance in the manner designed by your said member, or in any other manner, under the additional pains and penalties of the law, which you would thereby incur. And in order to the further security to the United States against such additional wrongs, I now inform your body that I have appointed a special agent on behalf of the United States to look to this matter, as well as to others touching the government interests, with instructions to report to me forthwith any infraction of this prohibition, so that the proper department of the government may be duly informed of it. This agent is Nelson Pitkin, esquire, who is to be recognized, obeyed, and respected accordingly.

Your body ought further to be aware that no county court can en-

tain or exercise jurisdiction over any cause wherein the United States is a party, and that this attempt on the part of your body to ignore the United States in this cause, which is in truth the only party against which you can truly take issue in regard to it, and to endeavor, by the extraordinary means which I have already shown up to you, to substitute Mr. Robert M. Millar in lieu of the United States as your legal antagonist, before a petty tribunal, can only find its parallel in the erasure of the name of Charles C. Sholes, a man supposed to comprehend all the responsibilities of the oath which was necessary to the procuring of the writ, and substituting the name of one who was altogether unaware of the responsibilities he assumed in the premises. I entreat you, as the guardians of the interests of the people of your town, to retrace your steps, and not subject them to the heavy penalties at law which will fall upon them by the heavy damages which must ensue; and I warn you that you save yourselves from the grave pains and penalties that must fall upon you should an action lie, before the higher courts, of a conspiracy, through false pretences, to deprive the United States, even though temporarily, of the custody and use of its property in carrying on its harbor improvements elsewhere than at Kenosha. In order that this warning may present itself to your minds with fair and due weight, I now advise you that my instructions from the War Department require me, in regard to all the harbor improvements under my charge, to dispose of the machinery, implements, and other property at the close of each work, the proceeds to be expended upon the said improvement, and the mode prescribed for such disposal or sale is, that the value shall be assessed under a board of survey, and if the price so assessed can be obtained at the place, I may sell it for the same, or transfer it at the said price to any other harbor requiring it, according to my option and judgment.

I have already transferred this property to another harbor, in pursuance of these instructions, and I am hourly expecting a steam vessel to call here for the purpose of towing it away. Take heed, therefore, that you do not aggravate the wrong you have already committed in detaining that steamer under demurrage when she arrives, or in depriving that harbor, which is now the owner of this property, (or to which, rather, it now appertains,) of its immediate use in opening a channel over the bar which obstructs its entrance by vessels, because the commerce that seeks it is so extensive that its fair and *bona fide* value extends to several millions of dollars, a fact easily shown in the courts, and the damages for any such obstructions by this unlawful act of yours would have to be assessed accordingly. I suppose you are aware that the penalty, in each case of conspiracy by false pretences against your country, may extend to years of imprisonment, in addition to heavy pecuniary fine. Such, in fact, is the law, and I would entreat you to take heed accordingly.

If, as is estimated in the letter of the mayor of this date, the city of Kenosha claims the property as her own, why is it that no such claim was ever presented to the proper department of the government to obtain possession of it, which your body must be aware was the only proper mode of proceeding? Nay, I will ask, why was it that no such

claim was ever preferred before any United States officer or agent, until after the violent and unlawful seizure, and then only as an excuse for the act? This inconsistency is not, however, greater than that of first trying to borrow or hire, and then to purchase from the United States, this very property, at an unjust valuation, which you assumed, uninvited by me, the privilege of assessing—you having no right or authority to constitute yourselves the assessors—and when it is refused to you at your own price, of finally seizing it under false pretences and procured swearing, claiming that it was all the time yours.

I believe it is not a usual thing for a person, or an association of persons, to offer, of their own free will and motion, five hundred dollars for what they know already to be theirs.

Your attorney, Mr. E. W. Evans, called on me to-day, and proposed, at the suggestion of the mayor, to read to me, unofficially, certain papers which he brought with him, to show the grounds of the claim set up by the corporate authorities of Kenosha to this property. I was obliged to decline this mode of proceeding. Any papers or evidence which your body have to submit for my consideration must be communicated and put into my possession by the mayor and common council in an official manner, for the reason that, if I think it necessary, I may be enabled to forward them to the proper department of the government for its consideration and judgment. I will remark, however, that I understood the attorney to say that the property was now claimed as belonging to the city of Kenosha on the ground that it was, some years ago, abandoned by the United States in a sunken condition, and that the city had acquired its title to it by raising and reclaiming it from total loss. In answer to this plea, I say to your body, that even if the property had ever been apparently abandoned in the manner stated, still, it could not have become the property of the city of Kenosha, or of any other party, by the course said to have been pursued. The most that could have been done, after ascertaining the abandonment in an authentic manner, would have been to have proceeded under the law of salvage, and the adjudication of the court having jurisdiction in the case. No such proceeding, I am sure, ever took place. But, in order to dispose of all this sort of pretence in a word, I now state to your body that this property was never, at any time, abandoned by the United States; and although the city may, at one or two periods, have incurred the expense of some two hundred dollars, or thereabout, in raising the pile-driver when sunk, yet it was done on a regular application to the United States agent, then in office here, from the city authorities, to be permitted to use it for a limited time free of hire, provided they would be at the expense of raising it; whereupon the United States agent addressed a letter to the proper department at Washington, asking if the permission could be granted on the conditions stated, and he received for answer, that it was granted, provided that the property should be used under the control and direction of the United States agent, who still retained the custody of it, the city paying the current expenses incurred in its use for the city's benefit. Here, then, there was no abandonment by the United States, but a steady adhesion to the property, which continued always to be borne on the returns of the United States agents, even

up to the present time, as the property of the United States, and said agents have always been thus responsible to the United States for it under their bonds.

To conclude all further discussions on this point, I need only to refer to the letter I received from the mayor this very day, in which he renews to me a proposition to purchase this property from the United States at a fair price, or words to that effect. In answer to this proposition, I regret to be obliged to say that I cannot entertain any proposition from your body on this subject until after you shall have so far retraced your steps as to have loosed the property from the place where you now hold it in unlawful durance, and shall have caused it to be brought back and attached to the place, on the United States pier, from whence you caused it to be removed, and reported to me or Mr. Myers as restored to the United States and my custody and possession.

My duties may require me to leave here on Monday afternoon by three o'clock, and it will be necessary for me to receive your final answer by that hour, because then I shall report all proceedings, without further delay, to the proper department at Washington, in order that their commands in the case may be issued for my government.

JAMES D. GRAHAM,

Lieut. Colonel, Sup. Eng. of Lake Michigan Works.

The MAYOR AND COMMON COUNCIL

of the city of Kenosha, Wisconsin.

C 23.

Colonel Graham to the Sheriff of Kenosha County, Wisconsin.

GENERAL SUPERINTENDENCE,

LAKE MICHIGAN WORKS,

Kenosha, October 1, 1855.

I hereby call on you to loose your hold on the horse power pile-driver and the crane scow belonging to the United States of America, which you forcibly and unlawfully wrested from the custody of myself and my lawfully appointed agent in behalf of the said United States, on or about the twenty-seventh day of September, A. D. eighteen hundred and fifty-five, and that you give me written assurance that you have done so, under the penalties and pains of the law in case of your failure so to do. And I further notify you, and warn you, that no city council, nor no county court, nor no attorney or deputy acting for either can authorize you to take, or hold in durance, the property of the United States, and that no such petty court possesses jurisdiction to levy upon the United States property, or to entertain a suit in relation to any cause wherein the United States is a party; and further, that the United States is the real and only party against you and your abettors in having seized, and in now holding on to the said horse power pile-driver, and the said crane

scow, either, or both; and I warn you to take notice that these articles are *bona fide* the property of the United States.

I further notify and warn you that neither the county nor circuit court for the county of Kenosha, Wisconsin, nor the common council of the city of Kenosha, in said State, nor their attorney acting for the said common council, or otherwise, can hold you harmless in having seized this property, nor in holding on to it. Therefore, repair your unlawful act as far as you can, by releasing your hold on said property speedily, and by giving me notice in writing that you have done so, under the pains and penalties of the law if you fail to do as you are herein required.

JAMES D. GRAHAM,
Lieut. Col., Sup. Eng. of Lake Michigan Works.

JOSEPH I. EHLE,
Sheriff of the county of Kenosha, Wisconsin.

C 24.

The Sheriff of Kenosha county to Colonel Graham.

SHERIFF'S OFFICE,
Kenosha County, October 1, 1855.

I received a communication this afternoon from you with regard to certain articles or property belonging to the United States, lately replevied by me by authority of a process issued from the circuit court for the county of Kenosha, wherein the city of Kenosha is plaintiff, and the United States defendant.

In answer to which, I reply, that I executed the writ as required by law, and have delivered the property, as commanded in said writ, to the city of Kenosha, to a proper agent appointed by the city for that purpose.

I have, therefore, no further claims over said property.

J. I. EHLE,
Sheriff of Kenosha county.

JAMES D. GRAHAM,
*Lieut. Colonel, Superintending Engineer
of Lake Michigan harbor works.*

C 25.

The President of the Common Council to Colonel Graham.—Surrender of the United States property by the common council.

OFFICE OF COMMON COUNCIL,
Kenosha City, October 1, 1855.

SIR: Your communication (of September 29) was referred by our mayor to myself, in consequence of the mayor's illness. I forthwith caused the common council to convene.

By their vote they required me to communicate to you that they have receded from their former action, and ordered the suit discontinued, and the property which had been replevied returned to your charge as you required.

I have the honor to be, sir, yours, most respectfully,

REUBEN H. DEMING,

President Common Council Kenosha City, Wisconsin.

Lieutenant Colonel JAMES D. GRAHAM.

C 26.

Regulation issued by Colonel Graham for the protection of the United States piers, &c.

GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Kenosha, October 1, 1855.

Nelson Pitkin, esq., of the city of Kenosha, is hereby appointed, under the authority of this office, to act as the agent of said office, in my absence, to take charge of the United States piers, and all United States property at this place appertaining to the harbor improvements; and all persons are hereby required to recognize, respect, and obey him accordingly. No work of any kind will be allowed to go on on the pier, except under his orders and supervision, in my absence, and then in the manner dictated by him under my authority. The piers must not be loaded with any heavy materials, as it will injure them. More specific rules will be issued, as soon as practicable, on this point.

JAMES D. GRAHAM,

Lieut. Col., Sup'g Eng. of Lake Michigan Works.

C 27.

Estimate of the cost of a chevaux-de-frise sand barrier, for Kenosha harbor, 600 feet long and 13 feet 9½ inches high.

1. Estimate for a single *cheval-de-frise* barrier, 12 feet long and 13 feet 9½ inches perpendicular height:

For 1 piece of pine timber, 12 feet long and 6 inches by 6 inches square, = 36 feet, board measure, of joisting, at \$16 per M.....	\$0 58
For 4 pine planks, each 18 feet long and 12 × 3 inches, = 216 feet, at \$17 per M.....	3 68
For 18 pine boards, each 12 feet long and 12 × 1 inches, = 216 feet, at \$16 per M.....	3 46

For 26 lineal feet of pine plank, 12 by 3 inches, for braces = 76 feet, board measure, at \$17 per M.....	\$1 32
For 12 wrought-iron spikes, $\frac{3}{8} \times \frac{3}{8}$ inch square, = 7 lineal feet = $3\frac{1}{2}$ pounds, at 8 cents.....	26
For 4 pounds cut nails, at 5 cents.....	20
For 1 iron hook and 2 staples.....	25

Workmanship.

In mortising 4 planks, and fitting and nailing braces and siding, 2 days' work for 1 man, at \$1 25 per day.....	2 50
For drayage, &c.....	75
Superintendence 1 day, at \$2.....	2 00
Total for each <i>cheval-de-frise</i>	15 00

2. For 50 *cheval-de-frise*, as per drawings on sheet G No. 28, at \$15 each, \$750.

J. D. GRAHAM,

Bvt. Lieut. Col., Sup'g Eng., &c., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

C 28.

Estimate of the cost of extending the piers of Kenosha harbor, Wisconsin, by eleven cribs, (seven for the north pier, and four for the south pier,) each to be 32 feet long, 20 feet wide, by an average height of 18 feet; (the average depth of water being 13 feet.)

1. For a single crib, 32 feet long, 20 feet wide, and 18 feet high, according to case 1st; see sheet G No. 19:	
For 2,457 lineal feet of pine timber, hewn 1 foot square, at 16 cents per foot.....	\$393 12
For 880 lineal feet of white oak timber, hewn 1 foot square, at 20 cents per lineal foot.....	176 00
For 1,482 feet, board measure, of 3-inch white-oak plank, for flooring, at \$20 per M.....	29 64
For 2,981 pounds of 1-inch square wrought-iron for bolts, at 4 cents per pound.....	119 24
For 137 pounds of wrought-iron spikes, $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, at $7\frac{1}{2}$ cents per pound.....	10 28
For $56\frac{1}{4}$ cords of hard boulder stone, at \$8 per cord of 128 cubic feet.....	450 00
Estimated cost of materials.....	1,178 28

Brought forward.....	\$1,178 28
Labor, carpentry, and superintendence.....	400 00
Add 10 per cent. for contingencies.....	157 80
Estimated cost of one crib.....	1,736 08

Then, 11 cribs, at \$1,736 08 each, = \$19,096 88.

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

C 29.

Estimate of the cost of dredging required to deepen the channel to twelve feet by 175 feet wide over the bar at the entrance of Kenosha harbor, and to obtain the same depth from thence between the United States piers to their western extremity; and also to obtain a depth of ten feet in the channel marked E F on map G No. 27, being 600 feet long by 160 feet wide.

1. On the bar and between the United States piers—	
For excavating and removing 6,370 cubic yards of light sand, at 12 cents per cubic yard.....	\$764 40
For excavating and removing 20,178 cubic yards of stiff clay and sand, at 25 cents per cubic yard.....	5,044 50
2. In the proposed channel E F—	
For the excavation and removal of 11,318 cubic yards of soft mud and sand, at 10 cents per cubic yard....	1,131 80
For the excavation and removal of 3,773 cubic yards of a harder mixture of clay and sand, at 20 cents per cubic yard.....	754 60
	7,695 30
Add for superintendence and contingencies 10 per cent.	769 50
Amount required.....	8,464 80

J. D. GRAHAM,

Bvt. Lieut. Col., Sup'g Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

C 30.

Estimate of the cost of dredging required to deepen the basin west of the United States piers at Kenosha harbor and extending to the west as far as the bridge I on main street, and as far north as the foot-bridge G H, so as to obtain a depth of ten feet of water throughout.—(Map G No. 27.)

For the excavation and removal of 67,615 cubic yards of soft mud, at 8 cents per cubic yard, (being in smooth water and the soil being soft).....	\$5,409 20
For the excavation and removal of 16,900 cubic yards of ordinary sand, at 10 cents per cubic yard.....	1,690 00
For the excavation and removal of 8,455 cubic yards of stiff clay and sand, at 20 cents per cubic yard.....	1,691 00
	8,790 20
Add for superintendence and contingencies 10 per cent....	879 02
Amount required.....	9,669 22

J. D. GRAHAM,

Bvt. Lieut. Col., Sup'g Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

C 31.

Estimate of the cost of dredging required to produce a depth of ten feet of water in the north arm F H L B, and in the west arm I K, of the basin of Kenosha harbor.—(See map G No. 30.)

1. For the north arm: area = 56,944 square yards.	
For the excavation and removal of 94,928 cubic yards of soft mud, at 8 cents per cubic yard.....	\$7,594 24
For the excavation and removal of 18,961 cubic yards of sand and stiff soil, at 15 cents per cubic yard.....	2,844 15
	10,438 39
Add 10 per cent. for superintendence and contingencies	1,043 83
Required for the north arm.....	11,482 22

2. For the west arm: area = 37,458 square yards.

For the excavation and removal of 62,430 cubic yards
of soft mud, at 8 cents per cubic yard..... \$4,994 40

For the excavation and removal of 18,729 cubic yards
of sand and stiff soil, at 15 cents per cubic yard.... 2,809 35

7,803 75

Add 10 per cent. for superintendence and contingencies 780 37

Total required for the west arm..... 8,584 12

Total required for the north arm, as above..... 11,482 22

Amount required for both arms..... 20,066 34

C 32.

Statement of the amount of duties collected at the port of Kenosha, State of Wisconsin, on foreign merchandise, from January 1, 1855, to December 31, 1855, showing also the enrolled tonnage of this port on December 31, 1855, as appears on the records of the custom-house, and showing the number of arrivals and departures at the port of Kenosha, from March 1, 1855, to December 31, 1855.

Amount of duties received each month, from January 1, 1855, to December 31, 1855.	None.
Enrolled tonnage, December 31, 1855.....	730
Number of schooners enrolled.....	5
Number of arrivals and departures at the port of Kenosha, from March 1, 1855, to December 31, 1855.....	2,012
Tonnage of vessels arriving and departing in said period.....	35,996
Average number of arrivals and departures daily in said period.....	6
Average amount of tonnage daily arriving and departing in said period.....	117.7

Seven vessels are owned here, and take papers from this port, in addition to those reported.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

NELSON PITKIN,

Deputy Collector, Kenosha, Wisconsin.

C 33.—Statement of the quantity and value of articles of merchandise received at the port of Kenosha, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Barrels, bulk.....number..	5,510	\$10 00	\$55,100 00
Beer.....barrels..	469	7 00	3,283 00
Coal.....tons..	1,970	8 00	15,760 00
Fish.....barrels..	365	8 00	2,920 00
Fruit.....do..	1,830	2 50	4,575 00
Horses.....number..	41	100 00	4,100 00
Laths.....do..	516,653	8 00 per M.	41,332 00
Lumber.....feet..	7,950,232	15 00 --do--	119,253 48
Merchandise.....tons..	4,351	500 00	2,175,500 00
Pig iron.....do..	1,731	45 00	77,895 00
Salt.....barrels..	3,050	2 00	6,100 00
Shingles.....number..	999,000	4 50 per M.	4,495 00
Wagons.....do..	146	100 00	14,600 00
Whiskey.....barrels..	1,517	15 00	22,755 00
Total value of merchandise received at Kenosha, Wisconsin, in the year 1855.....			2,547,668 48

J. D. GRAHAM,

Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, December 31, 1855.

C 34.—Statement of the quantity and value of articles of merchandise shipped from the port of Kenosha, Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Barley.....bushels..	49,915	\$1 20	\$59,898 00
Beans.....do..	405	1 25 $\frac{1}{4}$	507 00
Beef.....barrels..	176	10 00	1,760 00
Beer.....do..	3,062	7 00	21,434 00
Bulk.....do..	5,147	10 00	51,470 00
Butter.....pounds..	183,068	16	29,291 00
Cattle.....number..	227	100 00	22,700 00
Corn.....bushels..	6,525	61	4,567 00
Flour.....barrels..	6,393	8 50	54,340 00
Grass seed.....bushels..	795	2 25	1,789 00
Hams.....tierces..	1,534	26 13 $\frac{1}{4}$	40,088 00
Lard.....pounds..	19,420	8	1,554 00
Malt.....bushels..	7,733	1 50	11,600 00
Merchandise.....tons..	1,679	500 00	839,500 00
Oats.....bushels..	182,409	35	63,843 00
Pork.....barrels..	4,137	18 00	74,466 00
Potatoes.....bushels..	5,004	40	2,000 00
Stoves.....number..	2,590	30 00	77,700 00
Wagons.....do..	467	90 00	42,030 00
Wagon skeins.....sets..	2,500	4 00	10,000 00
Wash-boards.....dozens..	2,114	3 00	6,342 00
Wheat.....bushels..	669,328	1 50	1,003,992 00
Wool.....pounds..	112,561	35	39,396 00
Total value of merchandise shipped from Kenosha, Wisconsin, in 1855.....			2,460,267 00

J. D. GRAHAM,

Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, December 31, 1855.

C 35.

OFFICE OF GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, July 10, 1854.

SIR: I have received your communication of the 30th ultimo, together with the three estimates forwarded therewith, and your quarterly return of public property. The quarterly returns should always be rendered in duplicate; and for this purpose, I enclose herewith the one you sent, so that you may return it to me with a duplicate to correspond, which please do without delay.

You will please proceed with the sheath piling as rapidly as it can be faithfully done, and in the manner explained to you when I was at Kenosha a fortnight ago.

The estimates for raising the north pier, and levelling it up, one foot, the entire length, &c., and for putting down two additional cribs of thirty feet long each, (one at the extremity of each pier,) will be forwarded to the chief topographical engineer with a requisition for funds to carry on the work. You will please make arrangements to procure the necessary materials as soon as practicable, and give me due information of the readiest and most economical mode of doing so, whether by private purchase or by advertising for proposals.

Please send me a duplicate of each of the estimates you forwarded with your letter of the 30th ultimo.

I received the map containing the soundings. They were very well as far as they went, but were not numerous enough over the bar opposite the entrance.

As it is very important that the bars off the entrances of all the harbors should be laid down periodically with great accuracy, in order, by comparing the maps of different dates, to be able to estimate the changes in their positions from time to time, and to investigate the causes of such changes, if any, I request that you will, as soon as practicable, make a thorough series of soundings after the plan exhibited on the accompanying map. In the first place, measure off equal distances, of 100 feet apart, from the eastern to the western extremity of the north pier, marking the points with red chalk, (so as always hereafter to be able to recognize them,) from *a* to *l*. Then do the same on the south pier from *m* to *u*. Then do the same on the pile wharf, from *v* to 3. The points thus marked, 100 feet apart, will show where to erect signals to govern the lines to be sounded on. Then sound carefully all the lines drawn in pencil on the map, noting the lines by the letters and figures, and also the soundings in a book. When this is done, set a compass or theodolite at the point *a* on the end of the north pier, and, by compass courses, fix your buoy and sound successively the lines drawn in pencil at every ten degrees, beginning on north 20° west and continuing round to south 40° east.

The soundings should all be carried out to twenty feet depth of water outside the bar when the length of your line will extend to that depth, which it will always do, except when the lines to be sounded run nearly parallel with the shore.

After your buoy is fixed in its position, corresponding as nearly as practicable with the course laid down on the map, observe and record its *actual* bearing, which will be the course on which the line sounded will be afterwards platted. For instance, in regard to the first line, you will try to get the anchor thrown exactly on the course north 20° west; but suppose, after it has been thrown, the buoy bears north 19° west or north $21^{\circ} 30'$ west, let it remain so, but record the *actual* bearing of it. Suppose the next bearing, instead of being north 10° west, should be north $8^{\circ} 15'$ west, or north 12° west; let it remain so, but record its *actual* bearing observed, and so on; because, when these lines are platted on their actual courses the soundings will occupy the correct positions corresponding to the real depths at the several points indicated. You need not dot out the bar, as, when you send me the map after the work is done, I will have the curves drawn at each increasing foot of depth. State whether your sounding pole and line are divided to feet and *inches*, or feet and *tenths of a foot*.

Very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Superintending Engineer, &c., &c.

SAMUEL HALE, Esq.,

U. S. Agent at Kenosha, Wisconsin.

4.—RACINE HARBOR, WISCONSIN.

In relation to this harbor, I have to refer for explanation to the accompanying maps, projected from careful surveys made under my direction, viz:

Map G No. 15,* projected on a scale of 100 feet to one inch, or $\frac{1}{1200}$, from a survey made between the 6th and 22d of July, 1854.—(See D 1, hereto attached.)

Map G No. 32, projected on a scale of 200 feet to an inch, or $\frac{1}{2400}$, from a survey made in December, 1855, by assistant John R. Mayer.

In my general report to you (No. 32) of August 19, 1854, the commencement of the extension of the piers at this place was mentioned. The work was prosecuted in accordance with the approved plan of the Board of Topographical Engineers, forwarded with your instructions of the 1st of July of that year, and was continued with energy until the close of that working season. The result was, that two cribs were added to the north pier, each crib being 32 feet long by 20 feet wide, and 23 feet high from bottom to top, and resting in 16 to 18 feet depth of water. These cribs were constructed in accordance with the accompanying instructions to agent Carswell, marked D 2, and the drawings shown on the accompanying plan of crib work, marked sheet G No. 19. When the outer crib was first sunk, there was a depth of

* This map (G No. 15) is now in the Topographical Bureau, having been forwarded with my general report, No. 73, of April 29, 1855. A duplicate of original is herewith forwarded for the engraver.

only 16 feet of water at its outer or eastern extremity. The increased velocity of the littoral current which it met soon, however, washed away the soil so as to create a depth of 18 feet. Owing to the open latticed bottoms to the cribs, which allowed the stone ballast to pass freely through and occupy the place of the displaced soil, the cribs gradually settled down almost exactly upon a level, until a clay bottom was reached ; and at this time, (December 31, 1855) there is not a difference of level of more than three inches in the extreme parts of or in any two points within the surface of these two cribs. They stand firm in position, and their flooring is almost exactly parallel with the surface of the water. I mention this fact as another illustration of the correctness of the principle of building the cribs with latticed bottoms, admitting the free passage of the stone through them to occupy the place of any displaced soil, and thus prevent all irregular tilting and a consequent torsion and rending of the crib timbers.

In regard to the amount of work done in dredging this harbor during the season of 1854, I beg leave here to quote from my general report to the bureau, No. 73, of April 29, 1855, as follows, viz :

“ So soon as the engine of the United States steam dredge could be repaired, after the accident reported in my No. 32, of the 19th of August last, the dredging was commenced for deepening the channel between the piers at Racine. This operation was begun on the 29th of August, and terminated on the 31st of October, (1854.) During the greater part of this period the weather was boisterous enough to interrupt the work altogether, or to cause the dredge to work to disadvantage. We, however, succeeded in removing 9,080 cubic yards from the channel between the piers, depositing the stuff taken out in deep water in the lake. This gave a channel at least eight feet deep by one hundred feet wide, (between the piers,) where there was previously an average depth of about six and a half feet only. Even this improvement was of great advantage to Racine.

“ It is to be regretted that there are not funds for continuing the improvements of this harbor the present season. It will be seen by my accounts for the fourth quarter of 1854, that the balance of the appropriation then remaining for this work was only \$8 07, which has been since expended. The agency was discontinued on the 31st of December last (1854,) under the department regulations of the 11th of October last.”

The above quotation concludes the account of the work done for the improvement of Racine harbor under my direction.

In the month of August, 1855, the small amount of materials, &c., remaining at this harbor, were sold under the provisions of the department regulations, there being no funds to employ a custodian to take care of them. The proceeds have been accounted for to the Third Auditor of the Treasury Department, and have since been nearly exhausted in the partial survey made in December, 1855, from which the accompanying map G No. 32, is projected. The small balance of \$70 now remaining on hand will be required to continue that survey and to show the state of the bar and channel on the opening of the navigation in the spring of 1856.

These periodical surveys of the bars and harbor channels are indis-

pensable to ascertaining the law by which they are affected, and hence to the devising of correct plans for counteracting the obstructions which are constantly forming, to a greater or less extent, to oppose the ingress and egress of vessels.

In addition to the dredging done in 1854, at the expense of the government appropriation for the improvement of this harbor, the work of dredging was continued by the city authorities in 1855, and by this means a depth of nearly nine feet of water was, at one period of the navigable season of this year, attained along the whole of the channel-way between the piers. This is known from the draught of vessels that were enabled to enter. A comparison of the two maps, G No. 15 and G No. 32, will, however, show that, notwithstanding all this dredging, the harbor and bar were found to be in a worse condition in December, 1855, than they were in on the 22d of July, 1854, a period anterior to all of the dredging above mentioned. We are here presented with a case for consideration similar to that mentioned in this report in relation to Kenosha harbor. We have here a practical demonstration of like effects produced by like causes. The distance between Kenosha and Racine, by the lake coast, is only $11\frac{1}{4}$ miles. There is nothing in the relative aspects of the two places that would cause them to be differently affected by the same winds, and there is no ostensible reason why the prevailing winds should not be the same at the two places. If there be any theory or pretence to the contrary, it would be a paradox in meteorology which ought to be settled by accurate observations with proper meteorological instruments. Indeed, I consider it essential that regular series of such observations should be instituted and prosecuted at all these harbors which are to be improved by government appropriations. The great power which operates to produce the littoral or shore currents of the lake is the prevailing winds, just as the great ocean current, called "the gulf stream," is produced by the trade winds. The first mentioned phenomenon is but a miniature demonstration of the same principle which is more boldly shown in the other. The wind, acting in its most prevalent lakeward direction, combined with this littoral current, produces the great power which is constantly forming sand-bars and shoals at all the harbor entrances on our extensive lake coasts. To counteract the effect of this great power upon a given point, is what we have chiefly to contend for in planning the harbor piers for all the lake ports intended to be improved.

The cardinal point which an engineer first aims at in undertaking to plan any of these harbor works is to ascertain, as nearly as possible, the direction and force of the prevailing winds. Erroneous information on this point will lead to an erroneous plan; and such, in fact, has too often been the case in accepting, as reliable, the reports of persons who have been perhaps long residents at a place, and who, therefore, were supposed to be well informed on the point in question, but who, in fact, had no means of forming an accurate conclusion, but had based their opinions on mere vague impressions derived from very cursory and perhaps inattentive observations. From the importance which I think attaches to the subject, I would respectfully ask authority to procure the necessary apparatus to have these meteorologi-

cal observations carried on at all the harbors under my direction for at least two consecutive years. The results obtained from them would enable the Topographical Bureau and the Board of Engineers to determine at what principal points they should, after that period, be permanently continued. They should always include, also, accurate tide registers, showing the fluctuations in the elevation of the surface of the lake, such as are now presented from the observations made at Chicago harbor.

The total cost of a complete set of meteorological instruments is estimated at no more than \$232 50, and the cost of observation would not exceed \$1 50 per day throughout the year. This is a very small expense, in comparison with the value of the results to be derived.

The plan recommended by the Board of Engineers, in their report of April 28, 1854,* for the improvement of this harbor, which was approved by the bureau and the War Department, requires that the further extension of the piers here shall be on a course of about north 77° east,† and that the north pier shall be extended out to twelve feet depth of water in the lake, and that the south pier shall be extended out until it be tangent to a line drawn southsouthwest from the proposed eastern terminus of the north pier.

Upon this principle the board draws the conclusion, from the maps before it, that an extension of one hundred and seventy-five feet will be sufficient to add to the north pier, and two hundred and sixty-five feet to the south pier.

According to the most recent survey, however, made in December, 1855, (see map G No. 32,) an extension of at least two hundred and thirty (230) feet will now be required for the north pier, in order to make it project lakeward of the 12 feet curve of the shoal shown to the northeast of the present terminus of that pier.

But, for reasons similar to those given in the case of Kenosha harbor, in the preceding part of this report, I would recommend that the north pier of Racine harbor be extended out until it reach to a depth of fifteen (15) feet of water. It will then meet a littoral current sufficiently strong to waft the silt, held in suspension, to the leeward of the main harbor entrance, or at least to diminish very much its deposit at that entrance. To reach this depth will require the north pier to be extended 288 feet, or by nine cribs, each to be 32 feet long, 20 feet wide, and 21 feet average height from bottom to top, the average depth of water on that line being 16 feet, (see map.)

The south pier will then have to be prolonged on the same course (north 77° east) 384 feet lakeward of its present terminus, in order to meet a line drawn tangent to this proposed terminus of the north pier, on a course of northnortheast and southsouthwest, as decided on by the board and the department. This will require twelve cribs, each 32 feet long, 20 feet wide, and 17 feet high from bottom to top, as they will rest in water of an average depth of at least 12 feet when they settle down, through the light sand newly deposited, to a firm bottom,

* See Senate document No. 1, (executive,) 33d Congress, 2d session, part 2, page 254.

† The course decided on for the extension of the Kenosha harbor piers is north $78^{\circ} 45'$ east. (See the above mentioned document, page 285.) The two cases I consider similar. The difference in the two courses is immaterial. They are prolongations of the existing termini.

which they will do immediately on being sunk in position by cause of the washing away of this light silt when it meets the increased current of the lake.

While I present an estimate (see D 4) for the extension of both piers, in accordance with the above principles of the Board of Engineers, I would respectfully suggest a modification as regards the south pier. It is this: I think its extension should be limited by a tangent line drawn from the proposed terminus of the north pier on a course northeast and southwest, instead of that adopted by the board, of north-northeast and south-southwest.

The winds most detrimental to the condition of the harbor, in driving in the silt and causing it to deflect from the north face of the south pier into the channel-way between the piers, come from the northeast in a far greater proportion than from north-northeast. The terminus of the south pier should, then, be such as not to meet and oppose the silt in its drift to leeward on that course, but should allow it to pass freely on.

Upon this point, after a close observation of the prevalent winds upon this lake, I am forcibly struck with the following passage in the printed report of the board above alluded to,* viz:

“A plan, so far as the two first conditions are concerned,” (that is to say, that the piers should extend to twelve feet depth of water, at least, and that they should be on parallel lines,) “is, thus, one of easy application to any locality. In regard to the third,” (that is, the determination of the relative lengths of the two piers,) “beyond the mere point that the windward pier should be the one of the greater length, the question can only be settled approximately, leaving the precise relative proportion dependent upon the effects produced during the progress of the operations. In the case of the harbor of Racine, the question of the proper proportioned lengths of the piers is further complicated, as, from the report of the agent,” (Mr. Hale, late agent,) “it would seem that the waves reflected from the inner line of the south pier renders the anchorage in the river above uneasy, notwithstanding the north pier, considered as the windward pier, extends out beyond, or overlaps it 180 feet. In this fact the board finds another reason for not defining precisely the relative lengths of the piers.”

The principles which should govern are, to my mind, clearly laid down in the above extract. The reflection of the waves “from the inner line of the south pier” not only “renders the anchorage in the river above uneasy,” as there stated, but it produces a still greater mischief in causing those waves thus reflected to deposit the silt they carry along in the channel-way; and this is, no doubt, one of the causes for the formation of the shoals, shown in map G No. 32, just within the channel near the extremity of the south pier. It is evidently the northeast winds that have chiefly done this, for they have prevailed during the past navigable season with unusual frequency and force. This, then, is the direction of the tangent to the extremity of the north pier which, I would suggest, should mark the limit of extension to the south pier. It is the direction adopted by the board

* See page 253 of part 2 of Senate Ex. Doc. No. 1, of the 33d Congress, 2d session.

to remedy a like evil in the case of Kenosha harbor, and I cannot perceive any difference of principle which should govern in the two cases.

The shoals that have formed higher up in the channel, between the piers, have no doubt been caused chiefly by the sand blown into it from the sandy beach. To remedy this, I would recommend the adoption of the *chevaux-de-frise* sand barrier, as in the case of Kenosha harbor hereinbefore stated, and shown in the drawings on the accompanying sheet, marked G No. 31. For this purpose there will be required 504 feet, lineal, of this description of barrier, which will cost, as per the accompanying estimate, marked D 6, the sum of \$630.

The shoals shown upon the map between the south pier and the bridge wharves of Raymond & Dutton, and of Waterman, have been formed by the resistance which those structures opposed to the free passage to leeward of the silt carried along by the littoral current. As in the cases mentioned at Kenosha harbor, they were allowed to be built out to an unnecessary distance from the shore. They were nearly destroyed by the violent storms in August last, and in rebuilding them the proprietors should be required not to project them further out than three hundred (300) feet from the shore. By proper dredging a sufficient depth of water to float the vessels that require a berth alongside of them for landing and taking in cargoes can always be maintained, if limited to the above mentioned length. If allowed to transcend that length they must prove a nuisance to the harbor and to commerce generally on the lake.

To restore a depth of nine feet at the harbor entrance, and between the piers as far up as their western extremity, will require the removal of light soil and sand to the amount of 5,494 cubic yards. To produce a depth of 12 feet will require, in addition, the removal of clay and a compact mixture of sand and clay to the amount of 14,880 cubic yards.

I herewith submit an estimate, marked D 4, of the cost of the pier extensions, according to the approved plan of the Board of Engineers, amounting to the sum of...	\$38,066 91
Also, an estimate, marked D 5, of the cost of dredging to produce a depth of twelve feet over the bar and between the United States harbor piers, amounting to...	4,817 20
Also, an estimate, marked D 6, of the cost of a <i>chevaux-de-frise</i> sand barrier, 504 feet long, amounting to.....	630 00
Also, an estimate, marked D 7, of the cost of a set of meteorological instruments, amounting to.....	232 50
Also, an estimate, marked D 8, of two periodical surveys, to show the effect of the proposed pier extensions on the character of the harbor and the bar at the harbor entrance, amounting to.....	245 84
	43,992 45
From which deduct balance of former appropriation on hand.....	70 00
Amount required to be appropriated for Racine harbor improvement.....	43,922 45

Racine is a port of delivery for foreign importations, and belongs to the Milwaukee district. There is a deputy collector stationed at the port of Racine. There is a coast light-house here, situated on an elevated bluff near the lake shore, and within the town plat near the intersection of the bluff shore with Seventh street. The light bears south $4^{\circ} 10'$ west, distant 1,987 yards from the present extremity of the United States north harbor pier.

The accompanying statement, marked D 9, shows that there are owned at the port of Racine 5 brigs, 18 schooners, and 3 sloops, amounting in all to 3,917 tons.

The total number of arrivals and departures at this port, during the navigable season of 1855, say from March 1 to December 31, was (see D 9) 2,768, being an average per day, during these 306 days, of 9 vessels.

The amount of tonnage which arrived at and departed from this port during the same period was 938,740 tons; or an average per day of $3,067\frac{8}{10}$ tons.

The amount of duties collected on foreign importations at this port, during the year 1855, was, as per same statement D 9, \$31,656 64.

The value of the imports to this port, domestic and foreign, by lake shipments alone, during the year 1855, was, as appears by the accompanying statement, marked D 10..... \$3,347,981 43

The value of the exports by lake, for the same period, was, as per statement D 11..... 686,496 17

This does not include the value of exports into the interior of the country, which item I have not been able to get.

Total value of the *lake commerce alone* at Racine during the year 1855..... 4,034,477 60

Statement D 12 shows that the amount and value of the city trade of Racine, during the year 1855, was \$3,016,050.

Statement D 13 gives the names and tonnage of 9 brigs, 10 schooners, and 2 sloops, in all 21 vessels, which belonged to the port of Racine at the termination of the fiscal year ending the 30th September, 1855. The total of this tonnage is 3,417 tons, which is valued at (\$35 per ton) \$119,595.

The discrepancy between this statement and that contained in D 9 arises from the one being made up to the period of September 30, and the other to that of December 31, 1855.

There is a railroad projected, and is now under construction, from Racine to Freeport, in Illinois. It is called "the Racine and Mississippi Railroad," and will unite at Freeport, Illinois, with the "Illinois Central Railroad," which extends on west, passing through Galena and terminates at Dunleith, on the Mississippi river. The distance from Racine to Freeport by this road will be, when finished, 102 miles. The distance through from Racine to Galena, which is situated on Galena river, within three miles of the Mississippi river, is 146 miles. The distance from Racine, Wisconsin, to Dunleith, (opposite to Dubuque, Iowa,) in Illinois, on the Mississippi river, is 162

miles. Thus will Racine be united in commerce with the valley of the Mississippi river, when her railroad shall be finished. Already 40 miles of it are finished, and the cars running on it from Racine to Elkhorn, Wisconsin. During the present winter and ensuing spring, the first division, extending from Racine to Beloit, Wisconsin, a distance of 68 miles, will probably be finished, and the whole line will probably be finished and in operation some time during the year 1856.

It is intended, finally, to open the railroad communication from Freeport directly to Savanna, on the Mississippi river, in the State of Illinois.

D 1.

Colonel Graham to Agent Carswell.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, Illinois, July 12, 1854.

Sir: Your communication of the 6th instant was duly received, and on the 10th the map showing the soundings taken by you reached me. They are very good, as far as they go, but are not numerous enough to show in full the extent of the outer bar. I herewith enclose a copy of the outline of your map, with lines drawn in pencil upon compass courses, on which you will please make additional soundings, and, after projecting them, return the map to me here.

In the first place, put a compass or theodolite at the end of the south pier at *a*, then mark a point on the north pier due north of *a* and call it *b*, and sound the line *a b*. Then take the middle point between *b* and *d*, and call it *c*. Then sound the lines *a c* and *a d*; then *a E*, till you reach 17 feet water. Then set the instrument at the point *e* at the northeast extremity of the north pier, and, by compass courses, fix your buoy and sound the lines drawn in pencil at every 10 degrees, from north 50° east to south 30° west, carrying the soundings out to 17 feet water wherever your length of line can be made to reach to that depth.

I will remark that, after your buoy is fixed in position, always record the *actual* bearing of it. It will be seldom that you will be able to fix it at *exact* intervals of 10° , though you will approximate to those courses as near as practicable. For instance, in regard to the first position, you will try, under the direction of the compass to have the anchor so thrown as that the buoy will bear north 50° east; but when the buoy floats to its position after the anchor is down, suppose it were to be found to bear north 49° east, or north $51^{\circ} 30'$ east, let it so remain, but record the actual course; and so on for all the courses, getting each as near to the multiple of 10° as convenient. When all these soundings shall be finished and projected, I will have the iso-

metric curves drawn here at intervals of one foot of increase in the depth of water.

Your quarterly return of public property was duly received. As it is desirable to have the quantity of timber of each varying length set down separately, I herewith enclose you a set of blanks, and request you will make a new return according to this form, and forward it to this office in duplicate.

In regard to the soundings and map, the scale of the map should be given, and also the interval at which the soundings are taken, apart. Please also state whether the pole or sounding line is graduated to feet and *inches*, or feet and *tenths of feet*.

Also the date or dates on which the soundings are made.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer, &c.

A. J. CARSWELL, Esq.,

United States agent, Racine, Wisconsin.

D 2.

Colonel Graham to Agent Carswell.—Instructions in relation to the manner of building cribs.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, July 14, 1854.

Sir: I herewith forward to you copies of the report and plan of the Board of Engineers for lake harbors and western rivers, of April 26th last, with the approval of the honorable the Secretary of War of May 26th last, in relation to the extension of the piers at Racine, all of which documents were received at this office on the 6th instant.

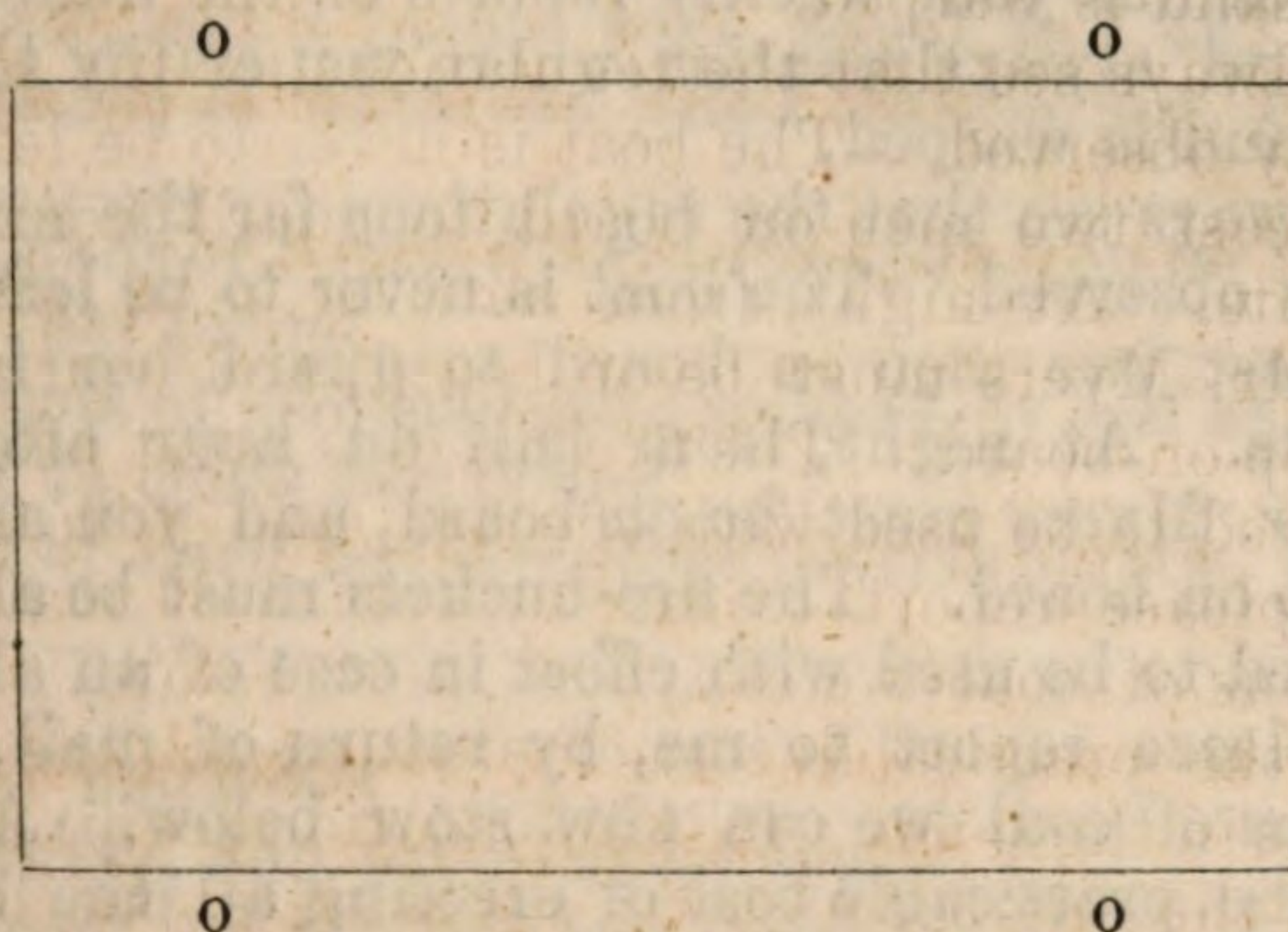
So soon as you shall have completed the duties assigned to you by my instructions of the 12th instant, you will form a working party and commence preparing the timber now on hand for framing two cribs (for the north pier) on the plan adopted as per model. They will be limited in width to twenty feet, unless the expense of reducing the cross-ties you now have on hand shall be greater than the cost of the additional quantity of stone required, in case the cribs for the north pier are made of the same width as the last one put down. In the absence of the specific information in the quarterly return forwarded to this office on the 30th ultimo, I am at a loss to know what is the length of the cross-ties already on hand for the north pier.

You will please furnish me with an estimate of the quantity and probable cost of whatever additional materials may be required to complete the five cribs directed by the Board of Engineers.

I will remark, that in the formation of all cribs of as much as twenty feet wide, they are in future to be divided into compartments by longitudinal stringers of timber 1 foot square of pine, below the

water level, and of oak above. Oak will, however, be used in the present case if you have no pine on hand, both for the longitudinal stringers and for the ties; the chief object now being to finish and sink as many cribs as possible, according to the plan, before the working season closes. The cross-ties and the longitudinal stringers will, where they cross one another, be halved in on one side of each, so that they may each form a solid wall in their respective tiers. No pile boxes will be made, as the piles within the frame work of the cribs are considered as not preventing the cribs from tilting, while in such an event they only tend to wrench apart the framing.

Before any crib is sunk, I will be upon the ground to lay out the new direction to be given to the piers, and then four outer piles will be driven to aid in the allignment of each crib, thus:



It is believed that the chief utility of the six piles, heretofore generally used within the frames of the cribs, has been confined to the aid they have afforded in keeping the cribs in the proper allignment at the time of sinking them.

When you are within a week of finishing these two cribs, ready to sink, please inform me, as I wish to be present when it is done.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Superintending Engineer, &c., &c., &c.

J. A. CARSWELL, Esq.,

United States agent, Racine, Wisconsin.

D 3.

Colonel Graham to the Captain of the United States steam dredge.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, September 21, 1854.

SIR: Your letter of the 16th instant was received yesterday. I regret to learn by it that you have had so much difficulty with the dredging at Racine, and that there has been so great a proportion of

weather unfavorable to that work. This was, however, to be expected at this season of the year. Until the usual equinoctial gales are over we cannot expect smooth weather. You must only use a sound judgment and be as economical as possible by discharging your crews when you cannot work, and re-engaging them when the weather proves favorable for work. When you come to clay bottom, and also when there is reason to suppose that stones of large size, or sunken timber, or old trees are in the way, you should work cautiously with a light force of steam. By this means you may prevent breaking the buckets and connecting chains.

You will avail yourself of every favorable day to do as much work as possible. It is to be hoped that the last of this month and the month of October will prove favorable to the dredging.

You will continue your weekly reports of the number of scow loads taken away, and always mention where you empty the scows and the distance the sand is warped.

You will always see that the regulations for the security of the vessel are strictly observed. The boat is never to be left in the day time without at least two men on board to guard her from fire and all other accidents. At night, from half an hour after sunset, either yourself or Mr. Myers must be on board, and you are both expected always to sleep on board. The fire-buckets must be always filled with water, prepared to be used with effect in case of an alarm of fire.

You will please report to me, by return of mail, if possible, the number of tons of coal we can now stow below. Also what would appear to be the practicable cost of erecting all the berths which the contractor put in the hold. It is information required at Washington. Mention also the number of berths that were put below. Mr. Carswell can allow one of his carpenters to estimate for you the probable cost of the berths below.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer.

Captain JOHN E. BROWN,

*in charge of the United States steam dredge,
now at Racine, Wisconsin.*

D 4.

Estimate of the cost of extending the United States harbor piers at Racine, by adding 288 feet to the north pier, and 384 feet to the south pier. Total 572 feet of pier work; or 21 cribs, each 32 feet long, 20 feet wide, and average height 19 feet from bottom to top; the average depth of water being 14 feet.—(See map G No. 32.)

1. Estimate of the cost of one crib, 32 feet long, 20 feet wide, and 19 feet high, from bottom to top, in 14 feet water, according to case 1st of crib work.—(See drawings on the accompanying sheet, marked G

No. 19. See, also, table T 1, and its formula in the preceding part of this report.)

For 240 lineal feet of pine timber, 1 foot square, for latticed bottom, at 16 cents per foot.....	\$38 40
For 2,372½ lineal feet of pine timber, 1 foot square, for the 3 longitudinal and the 3 transverse walls, for the 14 feet below the water surface, at 16 cents per lineal foot.....	379 60
For 880 lineal feet of white oak timber, 1 foot square, for the four piles, the sleepers for the flooring to rest on, and for the portion of the crib above water, at 20 cents per lineal foot.....	176 00
For 39 pieces of white oak plank, each 19 feet long, 3 inches thick, and 8 inches wide, equal to 1,482 feet, board measure, of white oak plank for flooring, at \$20 per M.....	29 64
For 3,150 pounds of 1-inch square wrought-iron for bolts, at 4 cents per pound.....	126 00
For 137 pounds of wrought-iron spikes ¾ by ¾ of an inch square, at 7½ cents per pound.....	10 28
For 61 cords of hard boulder stone for crib ballast, at \$8 per cord.....	488 00
Total cost of materials.....	1,247 92
Labor, carpentry, and superintendence.....	400 00
Add 10 per cent. on the two last items for contingencies	164 79
Estimated cost of 1 crib.....	1,812 71
2. Then 21 cribs, at \$1,812 71 each, equal to.....	38,066 91

J. D. GRAHAM,
Brevet. Lieut. Colonel, Superintending Engineer, &c., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

D 5.

Estimate of the cost of dredging Racine harbor and bar so as to produce a depth of twelve (12) feet on the bar at the harbor entrance, and the same depth between the United States harbor piers.

This work will require the excavation of 5,494 cubic yards of light sand, which will produce a depth of 9 feet throughout the above area. Then to continue the depth to 12 feet will require the excavation of

14,880 cubic yards of clay, and a compact hard mixture of clay and sand.—(See map G No. 32.)

1. For the excavation and removal of 5,494 cubic yards of light sand, at 12 cents per cubic yard.....	\$659 28
2. For the excavation and removal of 14,880 cubic yards of clay and a stiff mixture of clay and sand, at 25 cents per cubic yard.....	3,720 00
	4,379 28
Add 10 per cent. for contingencies.....	437 92
	4,817 20

J. D. GRAHAM,
Brevet Lieut. Colonel, Superintending Eng., &c., &c.
OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

D 6.

Estimate of the cost of 504 lineal feet of chevaux-de-frise sand barrier, to protect the channel between the piers at Racine harbor from the sand blown in by the wind, to be 13 feet 9½ inches high.

This will require 42 *chevaux-de-frise*, each 12 feet long, constructed according to the drawings in sheet G No. 31.

The cost of these will be the same as for Kenosha harbor, which is \$15 each.—(See the preceding estimate, marked C 27, under the head of Kenosha harbor.)

Then 42 *chevaux-de-frise*, at \$15 each, = \$630.

J. D. GRAHAM,
Bvt. Lieut. Colonel., Sup'g Eng., &c., &c.
OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

D 7.

Estimate of the cost of a set of meteorological instruments for observation at Racine harbor.

This item will be the same as for Chicago harbor.—(See estimate A 17, item 6, for that harbor, amounting to \$232 50.)

J. D. GRAHAM,
Bvt. Lieut. Col., Sup'g Eng.
OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

D 8.

Estimate of the cost of two periodical surveys of Racine harbor, to show the effect of the proposed pier extensions on the character of the harbor and bar.

Each survey will occupy 7 days, and will cost as follows, viz :

For services and subsistence of 1 surveyor 7 days, at \$5 per day.....	\$35 00
For services and subsistence of 2 chain bearers, 1 instrument carrier, and 4 boatmen for rowing and sounding—say 7 men, at \$1 25 each per day, including subsistence	61 25
Hire of a boat and oars 7 days, at \$1 50 per day.....	10 50
For station flags and implements.....	5 00
	111 75
Add 10 per cent. for contingencies.....	11 17
Amount required for each survey.....	122 92
	× 2
Amount required for 2 surveys.....	245 84

J. D. GRAHAM,

Bvt. Lieut. Col., Sup'g Eng., &c., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

D 9.

Statement of the amount of duties collected at the port of Racine, State of Wisconsin, on foreign merchandise from January 1, 1855, to December 31, 1855; showing also the enrolled tonnage of this port on December 31, 1855, as appears on the records of the custom-house; and showing the number of arrivals and departures at the port of Racine from March 1, 1855, to December 31, 1855.

Amount of duties received each month from January 1, 1855, to December 31, 1855.		Enrolled tonnage, December 31, 1855.	No. of barques enrolled.	No. of brigs enrolled.	No. of schooners enrolled.	No. of steamers enrolled.	No. of sloops enrolled.	No. of arrivals and departures at the port of Racine from March 1, 1855, to December 31, 1855.	Tonnage of vessels arriving and departing in said period.	Average number of daily arrivals and departures in said period.	Average amount of tonnage arriving and departing in said period, daily.
January		3,917	....	5	18	....	3	2,768	938,740	9	3,067 8-10
February .....			....			....					
March .....			....			....					
April .....			....			....					
May .....			....			....					
June .....			....			....					
July .....			....			....					
August	\$10,884 64		....			....					
September	3,763 20		....			....					
October	1,386 30		....			....					
November	6,232 50		....			....					
December	9,390 00		....			....					
Total	31,656 64	....	....	....	....	....	....	....	....	....	....

This report is imperfect in some respects, owing to the failure of masters of vessels in making their report in compliance with the requirements of the law. It is, however, correct, as far as the records of this office is concerned.

ISAAC S. ULLMAN, Deputy Collector.

Submitted with my annual report (No. 116) for the year 1855.

J. D. GRAHAM,
Brevet Lieutenant Colonel, &c., &c., &c.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, December 31, 1855.

D 10.

Statement of the quantity and value of articles of merchandise received by lake shipment at the port of Racine, State of Wisconsin, during the year ending September 30, 1855.

Articles.	Quantity.	Price for each.	Value.
Apples.....barrels..	5,345	\$2 50	\$13,362 50
Axles.....number..	32	10 00	320 00
Axes.....boxes..	36	10 00	360 00
Anvils.....number..	9	15 00	135 00
Bark.....cords..	916	8 00	7,328 00
Barrels, (bulk).....number..	1,892	10 00	18,920 00
Butter.....firkins..	123	10 00	1,230 00
Bricks, (fire).....number..	900	20	180 00
Bolts, (shingle).....cords..	557	14 00	7,798 00
Books.....boxes..	42	25 00	1,050 00
Buggies.....number..	56	100 00	5,600 00
Boots and shoes.....cases..	188	25 00	4,700 00
Coffee.....sacks..	2,670	15 00	40,050 00
Castings.....bundles..	1,257	7 50	9,427 50
Castings.....tons..	133	90 00	11,970 00
Crockery.....hogsheads..	570	50 00	23,500 00
Coal.....tons..	3,297	7 50	24,727 50
Cheese.....boxes..	158	5 00	790 00
Chairs, (railroad).....number..	2,243	20	448 60
Chairs.....do..	48	1 50	72 00
Composition.....barrels..	20	3 00	60 00
Candles, (sperm).....boxes..	45	20 00	900 00
Clocks.....do..	19	7 50	142 50
Carpeting.....rolls..	65	26 25	1,706 25
Chairs.....bundles..	12	1 00	12 00
Cider.....barrels..	50	6 00	300 00
Drugs.....boxes..	30	25 00	750 00
Fish.....barrels..	1,153	9 00	10,377 00
Fish.....boxes..	25	20 00	500 00
Forks, snathes, &c.....bundles..	1,108	5 00	5,540 00
Fruit.....barrels..	1,235	3 75	4,531 25
Fruit, (dried).....do..	75	15 00	1,125 00
Feathers.....pounds..	650	50	325 00
Felt.....rolls..	61	1 00	61 00
Goods.....boxes..	4,267	20 00	85,340 00
Goods.....bales..	2,450	30 00	73,500 00
Goods.....packages..	985	10 00	9,850 00
Glass.....boxes..	584	3 00	1,752 00
Gas pipe.....pieces..	69	1 50	103 50
Horses.....number..	119	125 00	14,875 00
Hides.....do..	637	4 00	2,548 00
Hoop poles.....M..	1,053 $\frac{3}{4}$	10 00	10,537 50
Herring.....boxes..	245	1 00	245 00
Iron, (pig).....tons..	389	40 00	15,560 00
Iron, (railroad).....do..	3,086	60 00	185,160 00
Iron, (sheet).....bundles..	230	25 00	5,750 00
Iron.....bars..	1,312	1 20	1,564 40
Iron.....tons..	1,425	60 00	85,500 00
Iron safes.....number..	12	100 00	1,200 00
Liquor.....barrels..	2,051	25 00	51,275 00
Leather rolls.....rolls..	687	35 00	24,045 00
Lumber.....M feet..	17,729	15 00	265,935 00
Merchandise.....tons..	4,725	400 00	1,890,000 00

D 10—Continued.

Articles.	Quantity.	Price for each.	Value.
Molasses.....barrels..	1, 224	\$20 00	\$24, 480 00
Molasses.....hogsheads..	178	60 00	10, 680 00
Marble.....tons..	58	45 00	2, 610 00
Mackerel.....barrels..	15	20 00	300 00
Nails.....kegs..	5, 555	5 00	27, 275 00
Nuts.....barrels..	28	25 00	700 00
Oil.....do..	689	40 00	27, 560 00
Oilcloth.....rolls..	40	16 00	640 00
Paint.....kegs..	3, 156	2 25	7, 101 00
Paint, (zinc).....do..	109	3 00	327 00
Paper.....bundles..	3, 606	3 00	10, 818 00
Pitch and tar.....barrels..	375	5 00	1, 875 00
Pails.....dozen..	85	2 00	170 00
Powder.....kegs..	48	10 00	480 00
Pelts.....bundles..	12	40 00	480 00
Pianos.....number..	6	200 00	1, 200 00
Rope.....coils..	225	50 00	11, 250 00
Raisins.....boxes..	423	2 50	1, 057 50
Rice.....barrels..	32	25 00	800 00
Staves.....M..	1, 564½	15 00	23, 463 75
Sugar.....hogsheads..	2, 129	70 00	149, 030 00
Sugar.....barrels..	561	20 00	11, 220 00
Stoves.....number..	1, 479	8 00	11, 832 00
Stoves, (cook).....do..	202	20 00	4, 040 00
Stoves, (parlor).....do..	737	12 00	8, 844 00
Salt.....bags..	6, 036	13	784 68
Salt.....barrels..	5, 821	2 00	11, 642 00
Starch.....boxes..	161	250 00	402 50
Spikes, (railroad).....kegs..	912	7 00	6, 384 00
Salæratius.....boxes..	146	3 00	438 00
Springs.....number..	48	1 50	72 00
Shovels.....dozens..	60	11 00	660 00
Soap.....boxes..	29	2 00	58 00
Shot.....bags..	75	2 50	187 50
Syrup.....barrels..	49	30 00	1, 470 00
Sofas.....number..	29	30 00	870 00
Tea.....chests..	1, 370	20 00	27, 400 00
Tobacco.....boxes..	187	25 00	4, 675 00
Tin.....do..	246	10 00	2, 460 00
Vinegar.....barrels..	60	6 00	360 00
Wagons.....number..	331	75 00	24, 825 00
Wine.....baskets..	148	12 00	1, 776 00
Wheels, (railroad).....number..	165	10 00	1, 650 00
Ware.....boxes..	80	7 50	600 00
Total value of imports by lake shipments alone at the port of Racine, in the year 1855.			3, 347, 981 43

J. D. GRAHAM,

*Brevet Lieutenant Colonel, Superintending Engineer, &c.*OFFICE OF GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1854.

D 11.

Statement of the quantity and value of articles of merchandise shipped, by lake vessels, from the port of Racine, Wisconsin, during the year ending September 30, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels	362	\$2 87½	\$1,040 60
Barley ----- bushels	34,671	1 10	38,138 10
Beans ----- barrels	482	3 50	1,687 00
Beef ----- do	2,331	13 00	30,303 00
Beer ----- do	224	8 71	1,952 00
Brick ----- M	4,401	5 00	22,005 00
Buckwheat ----- bushels	232	50	116 00
Butter ----- firkins	3,122	11 61	36,247 50
Candles ----- boxes	1,032	7 50	7,740 00
Castings ----- tons	540	50 00	27,000 00
Cattle ----- number	25	140 00	3,500 00
Corn ----- bushels	15,200	60	9,120 00
Corn meal ----- 100 pounds	130	1 50	195 00
Cradles ----- bundles	13	12 00	156 00
Eggs ----- barrels	184	9 20	1,692 80
Flour ----- do	20,708	8 00	165,664 00
Flanning mills ----- number	58	16 00	928 00
Feed meal ----- bushels	7,950	50	3,975 00
Flax seed ----- bags	368	50	184 00
Fur shoes ----- pairs	2,800	1 00	2,800 00
Grass seed ----- bags	43	5 00	215 00
Hair ----- hhds	9	11 36	102 25
Hay ----- tons	1,657	7 00	11,599 00
Hides ----- number	1,729	3 50	6,051 00
Leather ----- pounds	28,338	25	7,084 50
Lime ----- barrels	975	75	731 25
Liquor ----- do	109	64 41	7,021 00
Lumber ----- M feet	513	12 00	6,156 00
Mattresses ----- number	41	6 00	246 00
Oats ----- bushels	73,714	40	29,485 60
Packing barrels ----- number	16,114	1 12½	18,128 25
Potash ----- barrels	99	26 00	2,574 00
Potatoes ----- bushels	5,178	37½	1,941 75
Rags ----- pounds	85,019	3	2,550 57
Rye ----- bushels	8,718	1 00	8,718 00
Soap ----- boxes	1,864	1 50	2,796 00
Steam engines ----- number	17	1,200 00	20,400 00
Straw cutters ----- do	55	18 00	990 00
Trees ----- bales	65	12 50	812 50
Threshing machines ----- number	128	325 00	41,600 00
Tubs ----- dozens	56	9 00	494 00
Wood ----- cords	6,208	3 50	21,728 00
Wool ----- pounds	281,255	50	140,627 50
Total value of exports, by lake shipments alone, from Racine, during the year 1855 -----			686,496 17

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

D 12.

*Statement of the trade, manufactures, and sale of manufactured articles
in the city of Racine, for the fiscal year ending September 30, 1855.*

Articles.	Quantity.	Value.
Sale of merchandise, including dry goods, groceries, and provisions -----		\$400,000 00
Sales of lumber ----- No. of M.	6,000	720,000 00
<i>Manufactured articles.</i>		1,120,000 00
Boots and shoes -----		51,113 00
Beer, in barrels -----	3,300	19,800 00
Brick ----- M	1,467	7,336 00
Beef and pork ----- barrels	16,151	189,672 00
Clothing -----		81,971 00
Cooperage -----	74,074	66,943 00
Candles ----- boxes	3,096	23,220 00
Corn shellers -----	120	1,120 00
Fanning mills -----	610	12,200 00
Furs, fur shoes, &c -----		2,000 00
Furniture -----		20,000 00
Iron castings -----	300	15,000 00
Horse powers -----	15	1,875 00
Leather ----- pounds	205,689	51,422 00
Potash ----- barrels	130	3,380 00
Ploughs -----		2,000 00
Soap ----- boxes	5,592	8,398 00
Steam engines -----	40	48,000 00
Saddles, harness, &c -----		25,000 00
Threshing machines -----	136	47,600 00
Wagons and carriages -----		28,000 00
Miscellaneous business -----		90,000 00
Add all kinds of grain and other products not embraced in the above, at -----		1,100,000 00
Total value of the city trade of Racine for the year 1855 -----		3,016,050 00

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

D 13.

Statement and list of vessels, with their tonnage, belonging to the port of Racine, at the termination of the fiscal year ending September 30, 1855.

No.	Names of vessels.	Tons.
1	Brig Racine.....	229
2	Brig Tempest.....	209
3	Brig Sam Strang.....	222
4	Schooner Amelia.....	55
5	Schooner Union.....	87
6	Schooner Erie.....	62
7	Schooner Rambler.....	137
8	Schooner Belle City.....	168
9	Schooner Cherokee.....	203
10	Schooner Three Bells.....	80
11	Schooner Gilbert Knapp.....	197
12	Schooner Liberty.....	54
13	Sloop Lady Ann.....	30
14	Sloop Wunx.....	40
15	Schooner Monsoon.....	189
16	Brig Powhattan.....	273
17	Brig Andes.....	278
18	Brig Fashion.....	227
19	Brig Newhall.....	208
20	Brig J. W. Sargent.....	347
21	Brig Pacific.....	122

Total, 21 vessels, 3,417 tons, estimated at \$35 per ton, \$119,595.

J. D. GRAHAM,

Bvt. Lieut. Colonel, Superintending Engineer, &c., &c.

OFFICE GENERAL SUPERINTENDENT, &c.,

Chicago, December 31, 1855.

5. MILWAUKIE HARBOR, WISCONSIN.

I present the accompanying map, marked "sheet G, No. 16," for reference in relation to this harbor. It is projected on a scale of 200 feet to 1 inch, or $\frac{1}{2400}$, from a survey made in October, 1854, under the direction of this office, by H. W. Gunnison, esq., United States agent for this harbor.*—(See E 14.)

The existing appropriation for this harbor is applicable, exclusively, to the improvement to be made at the point called the "north cut," or the "straight cut," (see map G No. 16,) which is 3,100 feet north of the present harbor piers. The plan of this new work, as it has been approved by the department, provides for two parallel piers 260 (two hundred and sixty) feet apart, projecting on a course of north

* This map was rendered to the Topographical Bureau with my general report (No. 73) of the 29th of April, 1855. A duplicate original is herewith forwarded for the use of the engraver.

81° east, *magnetic*, which is nearly perpendicular to the lake shore, until a depth of twelve (12) feet of water be reached.

The requisite length of pier work, to fulfil this condition, is assumed by the engineer board, according to the map of Agent Gunnison from surveys in 1853, to be eight hundred (800) feet.* These maps are referred to by the board as follows:

“The board has had for its guide the chart of 1853, (No. 2,) upon which was projected the plans of H. W. Gunnison, esq., the local agent for that year; but it ought to remark that this chart differs from the charts made in 1844 and 1845, not only in the soundings where changes might be reasonably anticipated, but in the form of the shores near the proposed ‘cut,’ where we should look for some degree of permanency, or at least where the actual form of the shores is of great importance, and where that form should be exhibited with a considerable degree of precision.

“Owing to this want of agreement of the charts, the board has deemed it advisable to submit a copy of that of 1845, as well as that of 1853, with the plan of the proposed work projected upon it, so that the one which best conforms to the actual figure of the ground may be used in laying out the works.

“The direction given to the piers, although it does not exactly fulfil all the conditions that could be wished, is, nevertheless, not at all seriously objectionable. The choice of the direction given to them namely, north 81° east, was dictated by the fact that the proposed work, lying in the bottom of an open bay, which receives the storms nearly equally from the northeast and southeast points of the compass, forced the board to adopt, for the direction of both the piers, the one which should enable both of them to receive the storms at angles similar to each other, whether they came from the northeast or southeast.

“It has been usual to give to the windward pier, in a structure of this kind, a greater extension than that of the leeward pier, so as to afford protection to vessels as they enter. In the present case, it is doubtful whether either of them is the windward pier. For this reason, therefore, both piers have an equal length, and the windward one may at any time be lengthened, if, in fact, either of them should prove to be a windward pier.”

A due consideration of the above remarks, together with a comparison of the maps therein alluded to, of 1844, 1845, and 1853, with the map of Lieutenants Center and Rose of 1836,† and that herewith presented, (G No. 16,) of 1854, shows how important it is that all such surveys as those from whence these maps are derived should embrace accurately a much larger scope of the surrounding topography than is generally done, in addition to the mere locality selected as the particular site for the improvement of a harbor. It will further show the importance of instituting and carrying on series of accurate meteorological observations, embracing the direction and force of the winds throughout the year, the prevailing direction and force of the

* See the report of the board to the Topographical Bureau of March 4, 1854, Senate (Executive) Doc. No. 1, of the 33d Congress, 2d session, part 2, pages 237, 238, and 239.

† The earliest authentic map of detail we have of this locality.

drifting ice in winter, &c., for these are the governing elements which form the law by which changes of contour in the shores, the sandy deposits which form the shoals on the lake coast, and the obstructing bars at the mouths of rivers and harbor entrances are controlled.

The length for the piers for the new harbor at the "north cut," in order to reach a depth of 12 (twelve) feet of water in the lake, is derived by the board from the map of Agent Gunnison of 1853, to be eight hundred feet. This map is derived from surveys of the immediate locality, made in very minute detail. According to the map of Lieutenants Center and Rose, from accurate survey, made in equally minute detail of the same locality, in 1836, the length of piers then necessary to reach the same depth of water in the lake was five hundred and forty (540) feet.

There is no copy in this office of the map of 1844, alluded to by the board of engineers; there is one, however, of the map of 1845, alluded to by it, derived from a minute survey made in the summer of that year by Lieutenant J. D. Webster, of the topographical engineers.

According to this map, which gives the soundings much multiplied and with minute detail, the distance from the lake shore to the curve of 12 feet depth of water was then eight hundred and twenty (820) feet.

By a note upon this map, indicating in red the result of a re-examination and soundings made in October, 1852, by Mr. William Gamble, an accurate surveyor, the distance from the shore to the curve of 12 feet depth was seven hundred and ten (710) feet. And according to the map herewith presented, (G No. 16,) projected from minute survey made in 1854 under my direction, by Agent H. W. Gunnison, the distance from the lake shore at the same point, to the curve of 12 feet depth of water, was one thousand and twenty (1,020) feet.

The width of the peninsula, at the point where the cut is to be made to unite the Milwaukie river with the lake, varies very much at the various periods of comparison afforded by these maps, as follows, viz:

1. By the map of Lieutenants Center and Rose, of 1836, the width was 280 feet.
2. By the map of Lieutenant J. D. Webster, of 1845, 300 feet.
3. By Mr. Gamble's notes of his examination in 1852, 135 feet.
4. By Agent Gunnison's survey of 1853, 115 feet.
5. By Agent Gunnison's survey of 1854, (map G No. 16,) 205 feet.

All these various phases were no doubt caused by the abrasions and accretions upon the lake shore, as it was acted upon by the force of the winds most prevalent during the respective seasons named. Had a regular series of meteorological observations been made and registered during all this time, (an operation that would have been attended with a very small expense,) we should be able, by a direct comparison of cause and effect, to deduce the law which should govern in deciding upon the actual length requisite for the pier work, the direction of these piers with regard to the points of the compass, and (not by any means the least important point) the relative lengths of the north and south piers. In the absence of these reliable data I

will remark that, from the opportunities I have had of observing generally the prevailing winds upon this lake and their effects upon the shores, I believe the plan of the work as it now stands is judicious, and ought to be carried out as prescribed by the board.

I would, however, advise that correct observations of the kind above mentioned be at once instituted; and I include the requisite instruments for the purpose in the estimate marked E 34, herewith presented.

The commencement of the work for the improvement of this harbor was one of the first objects of my attention when I took my station here on the 20th of April, 1854. Being deeply impressed with the importance, as regarded both the local interests of this port and the accommodation to be afforded to the lake commerce generally, I proceeded thither on the 22d of that month, made the necessary inspection of the site, and on the 26th proposals were invited, through the public press of the place, for furnishing the timber necessary for an immediate beginning of the crib work. I only now awaited the action of the city corporation in obtaining a surrender to the United States of the site to be occupied by the work.

This, it was understood, would be done within a few days. In the meantime, I proceeded to Sheboygan to attend to the necessary preliminaries to commencing the work for the improvement of that harbor.

On the 5th of May I returned to Milwaukie and laid out the trace for the work, in accordance with the approved plan of the Board of Topographical Engineers. I now found, on conference with the city authorities, that they were about to enter into a contract with an individual to undertake the construction of so much of the new harbor as could be accomplished with the sum of \$50,000, authorized to be raised by the city for that purpose. It was necessary, if the funds appropriated by Congress were also to be expended upon this work, that the whole should be done in strict accordance with the plan of the Board of Topographical Engineers, which had received the consideration and approval of the War Department, and to that end be placed under the general direction and supervision of this office. This principle is well established by the rules and usage of the department. The jurisdiction and possession of the United States over the site was a principle established by law.

My report, No. 13, to the bureau, of May 12, 1854, (hereto attached, marked E 1,) and the correspondence and documents which were submitted with it, (hereto attached, marked from E 2 to E 5, inclusive,) will show fully the preliminaries as required by this office, and assented to by the city authorities. They will also show the portion of the work that was to be done by the city contractor in accordance with the government plan and under the supervision of this office, before the section to be built out of the United States appropriation could be commenced. I was notified by the city authorities that the sections to be thus constructed out of the city funds would be commenced by them as soon as their contractor could procure and bring upon the ground the requisite materials. As soon, therefore, as practicable, plans were digested and concluded at this office to govern in the mode of construct-

ing the cribs to form the harbor piers, and were forwarded, with a wooden model, to Agent Gunnison, to whom was assigned the immediate supervision and direction over the work, together with instructions, of which a copy is hereto attached, marked E 6. The drawings forwarded, and alluded to therein, correspond with those on the accompanying sheet, marked G No. 19, or case 1st of crib work. At a subsequent period it was found that many of the boulder stones, intended for ballasting the cribs for this harbor, were larger than the interstices in the latticed bottoms, shown in figure 1 of this sheet. The latticed bottom shown in figure 1 of sheet G No. 20, and the mode of bolting, together with all the other details on this last mentioned sheet were, therefore, substituted as the guide in constructing the crib work for this harbor.—(See E 20 and E 22.)

It was fully expected, under all these preparations, that the city sections would be pushed forward with an energy sufficient to ensure their completion, or very nearly so, by the end of the working season of the year 1855. Finding, however, on the opening of the spring or working season of that year, that very little progress had been made with the work to constitute those sections, and that what little was done was not in conformity with the adopted plans given above in detail, and directed to be pursued by the city council, in their proceedings of the 9th of May, 1854, (see documents E 2, E 3, and E 4, hereto attached,) Agent Gunnison was instructed, on the 29th of May, 1855, (as per E 17,) to report specially upon these points in his monthly reports to this office. His reports of June 2 and July 2, 1856, (see E 19 and E 21,) show how far the city contractor was allowed to depart from the plans that had been adopted for his government. In pursuance of the information contained in these reports, the instructions herewith presented, marked E 22, were issued to Agent Gunnison for his government. Upon his bringing the subject to the attention of the city authorities, a new contractor was chosen for the construction of the city sections of the work, and the common council reasserted the principles recommended in my communication to the mayor, of May 6, 1854, thus placing the supervision of those sections under the authority of this office and the immediate direction of the United States local agent stationed at that harbor.—(See E 23, 24, 25, 26, 27, and 28. See, also, regulation of the War Department, hereto attached, marked E 44.)

It was now near the close of the working season of 1855, and this circumstance, combined with the very boisterous nature of that season, generally, caused but little progress to be made in the construction of the city sections, up to the period for closing the work before the setting in of winter. Great energy and activity have, however, been displayed by the new city contractor (Mr. Barton) since he was employed, and all that was practicable was accomplished by him in the short period allotted to him for work. There is no room to doubt that he will fully do his duty the ensuing season, in pushing forward the construction of the city sections of the work, in strict conformity with the plans furnished for his government from this office. The fourth, or lakeward section, cannot be erected until after the first, second and third sections shall have been completed.

For information in regard to the progress of the fourth section and of the work generally, in detail, I beg leave to refer to the accompanying report of Agent Gunnison, marked E 30. The work appertaining to the fourth section is in advance of that for the three preceding sections, and would have been completed by this time but for the delay on the part of the city authorities in forwarding the work for their three sections.

I submit the accompanying estimate, marked E 31, of the cost of completing the fourth section, showing that an additional appropriation will be required for it of \$22,506 50.

I also submit the estimate of Agent Gunnison, marked E 32, of the cost, in addition to the appropriation by the city of Milwaukie, of completing the first, second and third sections of the work, which is undertaken by the city corporation, viz:

Total cost of first, second, and third, or city sections....	\$77,444 21½
Amount of city appropriation.....	50,000 00

Amount that will be required, in addition to the present city appropriation, for these sections	27,444 21½
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I also submit the accompanying estimate of the agent, marked E 33, of the cost of repairing the present harbor piers at the mouth of Milwaukie river, and of dredging the channel, amounting to \$23,784 26.

I also submit an estimate, marked E 34, for meteorological instruments, amounting to \$232 50.

Recapitulation of amounts required to be appropriated for Milwaukie harbor:

1. Estimate E 31. Required to complete the fourth section of the new harbor at the "North cut"	\$22,506 50
2. Estimate E 32. Required to complete the first, second, and third sections, in addition to the city appropriation.....	27,444 21½
3. Estimate E 33. Required for repairing and dredging the present harbor at the mouth of Milwaukie river	23,784 26
4. Estimate E 34. Required for meteorological instruments	232 50

Total required in addition to balance of former appropriation for Milwaukie harbor.....	73,967 47½
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If, in addition to the improvements above estimated for, Commercial Bay, (See map G, No. 16,) having an area of two hundred and seven thousand seven hundred and eighty square yards, equal to a space of six hundred yards long by three hundred and forty-six yards wide, (600 by 346 yards,) were improved, by dredging it to a depth of twelve feet, Milwaukie harbor would then be in a proper condition to accommodate the extensive local commerce of this port, and also to answer the requirements that are constantly made upon it to afford refuge and anchorage to the shipping engaged in the general commerce of the lakes during times of storm and peril. The loss of ship-

ping and of human lives near this harbor, during the past stormy season of navigation, was great, and shows how much may be done to save the lives of mariners and shipping, in future, by the expenditure of a less sum than the revenue on foreign importations received at this port, and paid into the public treasury, in the year 1855 alone.—(See statement hereto attached, marked E 35.)

The cost of dredging out this bay is not estimated for now, because the survey of the harbor gives no information of its present depth. We have not, therefore, the requisite data for the estimate. It will, however, be given, based upon a correct survey of this bay, in my next report.

The condition of the present harbor, at the mouth of Milwaukie river, requires immediate attention, to prevent its becoming closed against the most useful class of vessels that ought always to find easy ingress and egress to and from it. A reference to the map (G No. 16,) will show that only two thirds of the width between the piers afforded a passage for vessels drawing no more than eleven feet, when the survey was made in October, 1854. The appropriation last made confined the expenditure of its whole amount exclusively to the construction of the new harbor, at the "North cut." No portion of it could, therefore, be lawfully applied to dredging out the sand which had accumulated between the piers of the old or actual harbor. This fact was communicated to a committee of the Board of Trade of Milwaukie, in September, 1854. The committee was, at the same time, informed that if the city authorities would raise a sufficient sum to defray the current expenses of employing the United States steam dredge in performing the work required to clear the harbor from this obstruction, it would be done under the direction of this office.—(See E 7 to E 13, inclusive.)

No action to that effect was, however, taken by the city authorities on the subject during that season.

On the opening of navigation in the spring of 1855, the condition of this harbor was found to be much worse than it was the autumn preceding.

On receiving information of this fact from Agent Gunnison, and being very desirous to remove an obstacle so injurious to the commerce of this port and to that of the lake ports generally, if the means for thus employing the United States dredge boat could be placed at my disposal, I addressed a letter in May, 1855, to the committee of the Board of Trade calling its attention to the subject, and renewing my proposition of the autumn previous.—(See E 15 and E 16.)

The answer which I received, (see E 18,) dated the 30th of May, caused me to assign the next service of the United States dredge boat to Milwaukie harbor, supposing as I did that the necessary funds would be raised for setting her to dredging the harbor in the course of that summer. No further notice was, however, taken of the subject by the city authorities, and there being no United States funds to apply to this object, nothing could be done by this office in aid of this very important improvement. In regard to the importance of keeping up the harbor at the natural entrance of Milwaukie river, I

agree in opinion with the Board of Topographical Engineers expressed in their reports to the bureau of May 28, 1843,* and March 4, 1854.†

The reasons adduced in favor of this opinion in the first mentioned report are, in my opinion, very forcible.

They are based upon the primary principle upon which appropriations from the public treasury for works of this kind are sustained, namely, for the benefit of the commerce of the United States generally, rather than for any particular locality.

If the harbor entrance at the natural mouth of the river were neglected and allowed to fill up, the great extent of roadstead which is offered, by a little improvement, to commerce generally, between this mouth and the point fixed for the new harbor would also soon be lost. A reference to the map will show how great this is. In addition to the distance of four thousand feet (or more than three-fourths of a mile) of the river bed, having an average width of full four hundred and fifty (450) feet, and depth of water enough for the passage of the largest class of lake vessels, there would be lost to the general lake commerce as a necessary roadstead in times of severe storms, (when many other vessels than those belonging to this port solely are entitled to refuge and protection here) the valuable anchorage room afforded, with a little improvement, by Commercial Bay.

The statistics of the commerce of Milwaukie, hereto attached, viewed in connexion with the improvements now in progress, which must in a very few years greatly increase her commerce, present to my mind convincing proofs that she would be blind to her own interests, and to one of the chief means of promoting her prosperity, where she to abandon the policy of preserving these roadsteads.

I believe the day is not distant when it will become necessary to improve Commercial Bay as a place of refuge and safe anchorage for the lake shipping in times of peril, not only by deepening it, but also by enlarging it by dredging out a portion of the surrounding marsh.

The natural advantages are so few on this lake for creating harbors of refuge, without the great expense of outward breakwaters, that when they are found, as in this instance, near at hand, they should be taken full advantage of. It would be exceedingly unwise to turn aside from them and to go on counting annually the thousands of human lives, and the millions of treasure, lost for want of the accommodations to shipping which they offer.

In case a naval depot should be established by the United States on Lake Michigan, for the repair and equipment of armed vessels, the advantages offered by Commercial Bay as a roadstead, easily extended to any required capacity by dredging out the surrounding marsh, would give Milwaukie a strong claim to consideration in selecting a site for such an establishment.

The railroads now connecting with Milwaukie are the following, viz :

1. The Milwaukie and Mississippi Railroad is designed to terminate

* See Senate (Ex.) Doc. No. 1, of the 33d Congress, 1st session ; part 3d, pages 183 to 186.

† See Senate (Ex.) Doc. No. 1, of the 33d Congress, 2d session ; part 2d, page 237.

to the west, at Prairie du Chien, on the Mississippi river. Its length, when completed, will be one hundred and ninety (190) miles. It is already completed from Milwaukie to Madison, a distance of ninety-eight (98) miles. When completed to Prairie du Chien, it will connect the Milwaukie commerce, by means of steamers, with St. Paul and other points on the upper Mississippi river. A branch now runs to Janesville, and it will be prolonged very soon to Monroe, a distance of 43 miles from Janesville.

2. The La Crosse and Milwaukie Railroad is designed to connect Milwaukie with the Mississippi river at the mouth of its tributary the La Crosse river, or at Prairie la Crosse. The length of this road, when completed, will be one hundred and ninety-six miles. The course from Milwaukie to Prairie la Crosse is nearly north 71° west. It is already completed from Milwaukie to Horicon, at the foot of Lake Horicon, a distance of fifty-one miles. By the 31st December, 1856, it is expected to have it extended to Portage city on Wisconsin river, a distance of one hundred and twelve miles from Milwaukie.

3. The Milwaukie and Watertown Railroad now connects Milwaukie with Watertown, a distance of forty-five miles from Milwaukie on a course about north 76° west. It was completed and opened for travel and transportation on the 1st of October, 1855.

4. The Chicago, Milwaukie and Green Bay Railroad, (commonly called the Lake Shore Railroad,) is opened from Chicago to Milwaukie, a distance of eighty-five miles. It is designed to continue it north to Green Bay city, at the southernmost head of Green Bay, a distance of 100 miles in a straight line. The road will probably have a length of about 110 miles from Milwaukie to Green Bay city.

5. It is determined to open a railroad communication from Horicon, via Waupun, Ripon, Berlin, &c., to Stephens' Point on the Wisconsin river, and from thence to St. Paul, (in Minnesota,) on the Mississippi river. The distance from Horicon to Stephens' Point is ninety-two miles. From Milwaukie to Stephens' Point is one hundred and forty-three miles.

6. A connexion is determined upon and is now in progress of execution, directly by lake and railroad, between Milwaukie and Detroit. The plan is to construct a railroad from Detroit to Grand Haven, in Michigan State, a distance of about two hundred miles, and to have a connexion, by means of a line of steamboats, to run between Grand Haven, in Michigan, to Milwaukie, in Wisconsin. The distance across Lake Michigan from Grand Haven to Milwaukie is eighty-five miles. This is the widest part of this lake. Total distance by this line from Milwaukie to Detroit is 285 miles.

This line will give the most direct practicable outlet for produce sent to Milwaukie and destined for the eastern markets. It will also give the most direct and the quickest route, and hence the cheapest, for supplying the northern part of Michigan, Wisconsin and Minnesota, with dry goods, groceries, and other importations from the Atlantic ports.

Milwaukie is the chief port belonging to the Milwaukie district for the entry and payment of duties on foreign importations. There is a collector of customs stationed here. There is a coast light-house here,

which bears north $14^{\circ} 50'$ west, and distant two thousand seven hundred and ten yards, or say $1\frac{1}{2}$ mile from the north extremity of the north pier of the present harbor or mouth of the Milwaukie river.

The population of the city of Milwaukie was, by census taken in June, 1855, 30,443. It is rapidly increasing, both by native and foreign immigration, as well as by natural causes of increase; and it is now (December 31, 1855) estimated at 34,000.

The accompanying statement, marked E 35, shows that the enrolled tonnage belonging to this district, at this time, consists of two barques, nine brigs, eighty-one schooners, one steamer, two sloops, and four scows (so called) or large lumber three masted vessels. Total, ninety-nine vessels, amounting to $18,229\frac{7}{9}\frac{6}{5}$ tons.

The number of arrivals and departures at and from this port, from March 1 to December 31, 1855, was 5,004.

The total tonnage arriving and departing during the same period, was 1,481,400 tons.

Average daily tonnage arriving and departing in the same period, 4,841 tons.

Average number of vessels arriving and departing daily during the same period, $16\frac{1}{3}$ vessels.

The amount of duties on foreign importations collected at this port for the year 1855, \$173,130; or, at the average rate of \$474 32 per day throughout the year.

The value of the imports to this port, domestic and foreign, during the year 1855, was as follows, viz:

IMPORTS.

1. By lake shipment, see statement E 36 - - -	\$18,860,298 50
2. By the Milwaukie and Watertown Railroad, see statement E 37, (opened on the 1st October, 1855, to a length of 45 miles) - - -	1,614,675 12
3. By the La Crosse and Milwaukie Railroad, (opened to Iron Ridge, 45 miles from Milwaukie, November 21, 1855,) see statement E 38 - - -	340,740 01
4. By the Milwaukie and Mississippi Railroad, (opened 195 miles from Milwaukie,) see statement E 39 - - -	5,407,324 71
Total value of imports to Milwaukie in the year 1855	<u><u>26,223,038 34</u></u>

EXPORTS.

1. By lake shipment, see statement E 40 - - -	\$14,863,482 91
2. By the La Crosse and Milwaukie Railroad, see statement E 41 - - -	1,151,025 75
3. By the Milwaukie and Mississippi Railroad, see statement E 42 - - -	11,420,329 25
Total value of exports from Milwaukie in the year 1855	<u><u>27,434,837 91</u></u>

Aggregate value of the import and export trade of Milwaukie for the year 1855:

Imports	\$26,223,038 34
Exports	27,434,837 91

Aggregate value of imports and exports at Milwaukie, in the year 1855	53,657,876 25
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That is to say, fifty-three millions six hundred and fifty-seven thousand eight hundred and seventy-six dollars and twenty-five cents.

The value of that portion of the above imports and exports which passed over the St. Clair flats, as will appear in detail by reference to the statistics herewith presented under the head of "St. Clair flats improvement," was, in the year 1855, \$22,804,443 83; that is to say, twenty-two millions eight hundred and four thousand four hundred and forty-three dollars and eighty-three cents.

The accompanying statement, E 43, shows that the value of the manufactures in the city of Milwaukie, in the year 1855, was \$5,752,412; that is to say, five millions seven hundred and fifty-two thousand four hundred and twelve dollars.

E 1.

Colonel Graham to Colonel Abert.

[No. 13.]

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
Milwaukie, May 12, 1854.

SIR: After I had laid out the work for the harbor improvement at Milwaukie, finding that the city authorities were about entering into a contract with an individual contractor for the construction of so much of said improvement as could be accomplished for the sum of fifty thousand dollars, authorized to be raised by the city for that object, and considering it important that the position of the general government should be duly considered in the drawing up of that contract, not only in reference to the expenditure of the appropriation by Congress in behalf of that work, but also in regard to a proper transfer to the United States of the site to be occupied by the work to be constructed at the public expense, I entered into a correspondence with the mayor and city council of Milwaukie, in order to a clear understanding on the subject before the work should be commenced.

A copy of my letter to the mayor, dated May 6, 1854, (marked E 2,) and a copy of his reply, dated May 8, 1854, (marked E 3,) are hereto attached. I also forward herewith the resolutions adopted by the common council on the 9th of May, as printed in the "Daily Wisconsin" newspaper of the 10th, (marked E 4,) showing its action on the subject, and also the draft of an obligation on the part of the mayor and common council in relation to the necessary transfer of

title to the United States, and in regard to the means of carrying on the work so as to ensure a compliance with the government plans. This paper is marked (E 5.)

It is respectfully submitted for the consideration of the War Department. If approved, I request that it may be returned to me at Chicago, as it will then be duly executed and deposited in your office, and the work will be immediately commenced. I have already received and accepted proposals for the delivery of materials, contingent upon this approval. I believe the plan suggested will ensure an harmonious and prompt execution of the work, at the same time that the expenditure of the government and city appropriations will be kept entirely distinct, each upon an integral portion of the work, without any amalgamation of the two funds.

It is estimated that the three sections of the work contracted for by the city will extend the two piers, twenty feet wide, out into the lake a distance of 700 feet from the shore, and also open the cut and defend its banks, by piers twelve feet wide, and do the necessary sheath piling in conformity with the plan approved by the Board of Engineers and the honorable the Secretary of War.

These sections include the necessary dredging, also, in the river and between the piers, to the extent mentioned.

They will reach to a depth, in the lake, of about nine feet. The government appropriation would be expended in completing the piers by extending them to twelve feet water

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

*Lieut. Colonel, Superintending engineer of
Lake Michigan Works.*

Colonel J. J. ABERT,

Chief Topographical Engineer, Washington.

E 2.

Colonel Graham to the Mayor of Milwaukee.

OFFICE OF PUBLIC WORKS OF LAKE MICHIGAN,
Milwaukee, May 6, 1854.

SIR: Under the instructions of the Chief of Topographical Engineers, I have laid out the work for the harbor improvement at the straight cut in the city, in accordance with the plan recommended by the Board of United States Engineers, and approved by the Hon. the Secretary of War. Proposals have been received for furnishing the necessary materials for commencing said work immediately.

As a step preliminary to these operations, it will be necessary that a proper conveyance should be made by the corporation of the city of Milwaukee to the United States of the site or ground necessary for the said construction, in accordance with the plan of the Board of Engineers, to which I beg leave to refer your at the office of the United States agent in this city, Mr. H. W. Gunnison.

There is now remaining of the appropriation made by Congress for this work, for the fiscal year ending the 30th of June next, the sum of about \$9,480.

Besides which there are materials on hand here, to be paid for out of the balance of said appropriation, (which was originally \$15,000,) which cost \$8,570.

Total available out of the said appropriation for pushing forward the work without delay, \$18,000.

The Board of United States Engineers have estimated for the fiscal year that will begin the first of July next, for this work, the further sum of \$17,500, and contemplated a further similar estimate for the next succeeding year.—(See page 21 of part 3 of the President's message and accompanying documents, session of 1853-'54.)

Having learned that the city council has authority to raise the sum of \$50,000 in behalf of this work, I would respectfully suggest as follows, namely:

1. That the work be constructed in accordance with the plan of the Board of United States Engineers above referred to.

2. That the government appropriation now available be first expended upon it, under the direction of the United States superintending engineer, in such manner as to complete an integral portion of the work, as far as the money will allow.

3. That if by that time another appropriation shall have been made by Congress for continuing the said work, it shall be carried on as above described, as far as said additional appropriation will admit.

4. That if no such additional appropriation should be made by the time that the sum now available is exhausted, then the work shall be continued under the same system as before by the city authorities, and in accordance with the instructions from the War Department of June 4, 1853, (a copy of which is hereto attached,) the United States superintending engineer and the United States agent to be continued in the general supervision of the work, without any compensation other than that from the United States, but that all disbursements of the city appropriation shall be made by an agent of the city, who shall be accountable to the city authorities for the same.

My instructions from Washington already give me authority to act in accordance with the 1st and 2d items of these suggestions. If the 3d and 4th are assented to by the city authorities it will be necessary, on my part, to obtain the approval of the War Department before I proceed to act under them.

I have thought the suggestions here respectfully offered for the consideration of yourself and the city authorities important to the interests of the work in hand, from having understood that a contract was about being entered into for the construction of the work by the city authorities out of the appropriation raised by the city. Should such a step be adopted in the commencement, I apprehend it would have the effect of causing the United States government to withdraw altogether from the work and to leave it without interference, to be accomplished entirely by the city. My object in making these suggestions is, therefore, to harmonize the operations in such a manner as would ensure to the city the benefit of both the government and city appro-

priations, and in such manner as would probably receive the approval of the War Department.

I have the honor to be, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Sup. Eng. Lake Michigan Harbor Works.

Hon. BYRON KILBOURN, *Mayor of Milwaukee.*

E 3.

The Mayor of Milwaukee to Colonel Graham.

MAYOR'S OFFICE,

City of Milwaukee, May 8, 1854.

SIR: Your favor of the 6th instant has been duly received, and it affords me great satisfaction to be able to give the assurance that its contents are very acceptable indeed, sir. I cannot forego the opportunity of felicitating our city on the auspicious day which seems, at length, to be dawning upon our harbor improvement, after years of the most vexatious delays, which have operated to the serious damage of our commerce. The very considerate and conciliatory manner in which you have introduced and propose to conduct the government business, cannot fail to produce the most happy results; and it is a duty which I owe to you to give expression, in the name of the city, to the high gratification which your course is well calculated to inspire.

From various unauthorized givings out, it had been apprehended that the government authorities would claim an unconditional conveyance and surrender of jurisdiction of the harbor site, as a condition precedent to any expenditures being made of the government appropriations. Such a demand could not have been complied with; and had that been made a condition upon which alone the government expenditures could be made, we should have been compelled to forego the advantage of these expenditures, however great they might be and however reluctantly we might adopt any course producing such an effect.

The sentiment has become universal among all classes of our business men, and, indeed, of the mass of our citizens, that we *must* have a harbor at the site required by our commerce at whatever cost or sacrifice it might be to our city, and we could not consent to surrender unconditionally all right to carry on that work at the expense of the city to such an extent as may be found necessary to accomplish the desired result.

But the proposition submitted by you, being fairly carried out, will accomplish all they desire, and, I have no doubt, will be as readily assented to by the common council as by myself; and I shall take an early opportunity of laying the subject before them in a special communication and ask their concurrence therein.

Your third and fourth propositions are so reasonable in themselves that I cannot doubt they will be assented to by the War Department, and I think I hazard nothing in assuring you they will be by the city council.

By thus acting in concert, the greatest amount of work will be accomplished by the means at our disposal, arising both from the government and city appropriations, and it will require the whole amount which can be derived from both sources to make the harbor available. It will be a particular favor to the city to place the whole control of the work under your supervision and direction, and relieve the committee representing the common council in this behalf from onerous duty, but still leaving in their hands the responsible charge of disbursements and accountability for city funds expended; so far their duty would be appropriate, and from all further duty they would gladly be relieved.

With a cordial understanding on the basis of your propositions, we may readily anticipate an early opening of our harbor; and I can assure you that your co-operation in producing this result is greatly desired by our whole city, and will secure to you their hearty approbation and grateful thanks.

I have the honor to be, &c., your obedient servant,

BYRON KILBOURN.

Colonel J. D. GRAHAM,

Sup'g Eng. of the Lake Michigan Harbor Works.

E 4.

Proceedings in the common council of the city of Kenosha, Wisconsin, May 9, 1854, on the subject of Colonel J. D. Graham's communication respecting the harbor improvements.

GENTLEMEN OF THE COMMON COUNCIL: I have the honor of submitting herewith for your consideration a correspondence between Colonel J. D. Graham and myself, relating to the harbor, consisting of a communication from him, submitting certain propositions, having for their object a plan whereby the appropriations of the government and the funds of the city may be expended in the construction of the harbor, without any delay or disagreement, and a reply to it from myself on behalf of the city, concurring (so far as with propriety I could) in the suggestions made by him, and promising to lay the subject before this board, as early as practicable, for their determination.

The plan suggested by the colonel involves the necessity of some slight changes from the plan adopted by this board, but not such as will materially affect the cost of the work. It also involves a slight change in the position of the piers, giving them a direction between two and three degrees more northerly in bearing from the shore, which is quite immaterial, and may with propriety be adopted by this board.

On full consideration of the subject, I am prepared to recommend

the adoption, substantially, of all the suggestions made by Colonel Graham, and for that purpose I submit the resolution hereto appended. I also recommend the approval of the contract with Abel Hawley, prepared by the harbor committee in compliance with the resolution of this board, which is carefully drawn for the protection of the interests of the city; and the work, being executed under the direction and supervision of the government agents, will harmonize with the government work, and secure the rapid completion of the harbor, which is so greatly needed, with the least possible delay.

The fifty thousand dollars raised by the city is only sufficient to pay about three-quarters of the whole expense of the work, and if the remainder can be made up from the government appropriations, it is certainly a great object to avail ourselves of it, and thereby secure, at the earliest practicable moment, a complete and finished harbor.

The suggestions of Colonel Graham are very opportune, and well timed for the interests of Milwaukie, as neither the government nor the city appropriations, taken singly, would be sufficient to make the harbor as complete as it ought to be, but both applied together in the manner he proposes will fully accomplish that object.

It is but reasonable to suppose that the department under which he acts will readily assent to his views. Thus far Colonel Graham has shown a desire to consult the interests and wishes of our city and its people, and I trust that they in turn will be disposed to reciprocate his kindly feelings.

Respectfully submitted.

BYRON KILBOURN.

MILWAUKIE, *May* 8, 1854.

The following resolutions were thereupon adopted by the common council.

Resolved, That the direction of the piers and plan of the work at the harbor straight cut, heretofore adopted by the city, be so modified as to conform to the position and plan adopted by the government agents, so far as a modification of the said plan shall, on mature consideration, be deemed advisable, and that the execution of the work under the city authority be placed under the superintendence of the government officer of engineers in charge of said work, without any charge against the city therefor, but that the disbursements of the city funds be made by the proper city officers, on estimates to be furnished by the government engineers or superintendent having charge of the work; such superintendence to extend to the *manner* of doing the work, but not to the *time* of its execution, that being reserved to the city authorities.

Resolved, That the city will convey to the government the site of the straight cut, subject to the rights of the city to have the city appropriations expended without any delay under the supervision of the officer aforesaid, simultaneously with the expenditure of the government appropriations, and, with such reservations, the mayor is hereby authorized to make such release as may be by the Secretary of War required or the proper engineer department.

Resolved, That the contract drawn up by the harbor committee with

Abel Hawley, in pursuance of the resolution of this board, is satisfactory in its terms, and is hereby approved; and the mayor is hereby authorized to execute the same on behalf of the city, to be countersigned by the city clerk, endorsed by the comptroller, and filed in the office of said clerk.

E 5.

Conveyance which the corporate authorities of Milwaukee propose to make to the United States.

Whereas, the city of Milwaukee propose to expend a certain sum of money, not exceeding fifty thousand dollars, in the construction of a harbor at the site recommended by Lieutenants Center and Rose, commonly known as the "Straight Cut," and for that purpose have made an appropriation of said sum of fifty thousand dollars, and have entered into a contract with Abel Hawley, of the city of Milwaukee, to furnish materials and construct said work, or three sections of the same, reserving it optional with said city whether the said Hawley shall construct the fourth section or not, which said fourth section will complete said harbor; and, whereas, it is proposed on the part and on behalf of the United States, and desired by and on the part of said city, that the said harbor shall be constructed under the direction of the United States superintending engineer and the United States agent, acting under his instructions, for the harbor of Milwaukee, in accordance with the plan on file in the office of H. W. Gunnison, esq., United States harbor agent in said city, (said plan having been recommended by the Board of Topographical Engineers and approved by the Secretary of War of the United States,) to which plan reference is hereby made for more specific information; and, whereas, the expenditure of the amount appropriated by said city for the construction of said work will complete the first three sections of said work, and the said city confidently anticipates that the United States will complete said harbor by constructing said fourth section of said work, and earnestly desire that it will do so; and, whereas, it is required, on the part of the United States, as a step preliminary to the expenditure of any money on said work, that a proper conveyance of title to the lands proposed to be taken for said harbor in accordance with the said plan shall be first obtained by the United States; and, whereas, the said city of Milwaukee have not as yet obtained a full and perfect title to said lands, but are taking the necessary and legal means to obtain a perfect title to the same under and by virtue of an act of the legislature of the State of Wisconsin, passed April 1, 1853.

Now, this article of agreement made and entered into this _____ day of _____, by and between the city of Milwaukee, party of the first part, and the United States, party of the second part, witnesseth:

The said party of the first part, for the purpose of effecting the construction of the said harbor at the place above referred to, for and in

consideration of the sum of one dollar in hand paid by the said party of the second part to the said party of the first part, the receipt whereof is acknowledged, agrees that the said party of the first part, will (as soon as the same can be perfected, not exceeding one year from this date) procure, execute, and deliver, or cause to be executed and delivered to the party of the second part a good and perfect title to said lands so proposed to be taken for the purpose aforesaid, to be used by the party of the second part for the purpose aforesaid and for no other purpose, only reserving the right of constructing the said three sections of said work contracted to be constructed by said Abel Hawley, as above stated; and in the mean time to defend the said party of the second part against all claims for, or any amount of damages on account of or in consequence of constructing said work.

E 6.

Colonel Graham to Agent Gunnison.

OFFICE GENERAL SUPERINTENDENCE OF
LAKE MICHIGAN WORKS,
Chicago, August 30, 1854.

SIR: You will please advertise for proposals to furnish pine and oak timber for the construction of six cribs for the fourth section of the piers to form the harbor at the straight cut at Milwaukie. Each crib will be 32 feet long, measured upon the outside and middle walls, and 20 feet wide, and will conform in plan and dimensions with the model herewith forwarded, except that the middle longitudinal wall, or tier of stringers, will be composed of timbers 32 feet long, instead of 30 feet, as represented in the wooden model. Each end wall will be retired 2 feet within the extremities of the two outside and the middle longitudinal walls. This gives for the dimensions of each of the four compartments, measured in the interior, $12\frac{1}{2}$ feet long by $8\frac{1}{2}$ feet wide. The cribs will not be locked one with another, by halving a portion of the longitudinal timbers at their extremities, because in that case if a crib should tilt to one side and its neighbor not, or if one should tilt more than the other, the halved portion, made to form the lock, would sliver on one side, and thus destroy the effect of the outer tier of iron bolts, and weaken the joints at the cross-ties.

The grillage to form the bottom of each crib will be composed of six cross timbers, each 20 feet long and 12 by 12 inches, and four longitudinal timbers, each 30 feet long, and 12 by 12 inches, these last resting upon the six cross pieces, as is shown in the model, without any locking together, or letting one into another by notching. These grillage timbers are only locked with the wall timbers at the crossings, the longitudinal ones with all three of the cross walls of the crib, and the cross or lower timbers of the grillage with the two outside longitudinal walls only. This leaves a vacant space six inches in height between each cross timber of the grillage and the timber next above it belonging to the middle longitudinal wall. In the course of

construction this vacancy is filled by two timbers spiked on, each $12\frac{1}{2}$ feet long, and 12 inches broad by 6 inches high, thus completing the solidity of the middle longitudinal wall throughout. These two short timbers are pushed diagonally a little out of place in the wooden model, in order to attract attention, but are easily pushed back into place.

There are forty-eight interstices in the bottom of the crib, (twelve in each compartment,) each giving a clear open space 2 feet $4\frac{1}{2}$ inches long by 2 feet 2 inches wide, to allow the stone to pass freely through in case of the tilting of the crib to one side. An *enrochement* will thus be formed tending to check the undermining effect of the current, and to produce a firm base of support. The bolting together of the timbers of the grillage will be as shown in the accompanying drawing, marked figure 1. The bolting of the timbers which form the three transverse walls will be as represented in the vertical section, marked figure 3. That of the three longitudinal walls will be as shown in the vertical sections, marked figure 5, for the outside walls, and figure 6 for the middle wall.

Figure 7 is a horizontal projection, or view from above, of two cribs finished and sunk. The first and second compartments on the left are empty, to show the grillage and the soil at bottom through the interstices. The third and fourth compartments are represented as being filled with stone to the water level. The termination of the first crib and the left hand half of the second crib show the stone filling, and also the mode of laying and bolting on the sleepers, 6 by 9 inches, that are to support the plank flooring. The right hand half of the second crib represents the work as completed, with the flooring let into the upper timbers of the two outside walls, and spiked on to the sleepers.

In your supervision of the construction of the three first sections of the work now going on under the city contract, as well as in that of the fourth section, to be built by the United States, you will require a compliance with the above rules. You will observe that the manner of breaking joints of adjacent cribs in the timbers forming the three longitudinal walls above the water surface is shown in figure 8,* and also the mode of bolting the timbers together at the joints. The laying of the timbers above the water level is not shown in the *wooden* model. This is shown only in the drawings. No piles will be allowed within any part of a crib. They may be driven upon the proper direction before the cribs are sunk, to serve as guides in the alignment, or they may be suspended within iron bands, fastened on the outsides of the cribs, and floated out with them and let down in the usual way when the exact alignment is obtained, and then driven to serve for vessels to make fast to when laying near the piers.

In order to establish uniformity in the system for pier structures on the harbor improvements of Lake Michigan, models have been or will be distributed at the different works similar to that now sent to you, which will be borne on the quarterly returns of public property; also,

* This scarfing, or breaking of joints in the timbers above water for the purpose of uniting the several cribs, was afterwards rejected.—(See report, *ante*.)

a bill for timber for a crib of any height, showing the dimensions to be observed in advertising for proposals, similar to that herewith enclosed, marked T.—(See tables T, 1, 2, and 3, *ante*.)

In your monthly report of the 1st of September, please report fully upon the progress and character of the work commenced for the city sections.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Supt'g Eng'r, &c., &c.

H. W. GUNNISON, Esq.,

United States Agent, Milwaukie, Wisconsin.

E 7.

Colonel Graham to Colonel Abert.

[No. 43.]

OFFICE GENERAL SUPERINTENDENCE,

LAKE MICHIGAN WORKS,

Chicago, September 12, 1854.

SIR: I have just received the accompanying communication from a committee of the Board of Trade of Milwaukie, marked E 8, and a resolution passed by that board on the 5th instant, marked E 9, in relation to the accumulating obstruction to the entrance of the harbor at that place. Anticipating the details to be incorporated in my annual report in reference to this harbor, I have to state that the obstruction alluded to is of such a nature that I think it ought to be removed as soon as possible. I would therefore respectfully recommend that I be authorized to have the bar removed by the use of the United States steam dredge. I beg leave to enquire whether a part of the funds remaining applicable to that harbor can be applied to this object. In case it cannot, can I employ the dredge for this object, provided the city of Milwaukie will bear the current expense of working her under my directions, after the dredging at Racine shall be completed?

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Bvt. Lieut. Col., Superintending Engineer.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

E 8.

Committee of the Board of Trade of Milwaukie to Colonel Graham, in relation to the condition of the harbor.

MILWAUKIE, *September 6, 1854.*

DEAR SIR: At a meeting of the Board of Trade, held last evening, the undersigned were appointed a committee to forward to you the enclosed resolutions.

Within the past few months a deposit of sand has been formed near the mouth of the government piers, which already very seriously obstructs the entrance into the river, and is constantly increasing. With the aid of the government dredge, that obstruction could doubtless easily be removed; but if suffered to remain, or to increase, the consequent loss to the mercantile marine of the lakes would, during the ensuing fall, probably be very severe.

We trust it may be consistent with your arrangements to make an examination of this obstruction, and give us the aid of the dredge at an early day.

Very respectfully, your obedient servants,

BYRON KILBOURN,
JOHN G. INBUSCH,
S. B. GRANT.

Committee.

Colonel J. D. GRAHAM,
Sup. Eng., &c., Chicago, Ill.

E 9.

Proceedings of the Board of Trade of Milwaukee in relation to dredging the harbor entrance.

At a meeting of the Board of Trade, held at their rooms on Tuesday, the 5th September, 1854, it was unanimously—

Resolved, That, as great obstructions are being formed between the piers, and near them, at the mouth of our harbor, by the constant accumulation of sand, whereby the entrance into the river is now much obstructed, and is daily becoming more so, that Mayor Kilbourn, General Grant, and J. G. Inbusch be a committee to correspond with Colonel J. D. Graham, superintending engineer of rivers and harbors on this lake, and respectfully request of him the aid of the government dredge towards effecting the immediate removal of said obstructions.

The above is a true copy of the resolution.

S. B. GRANT,
Secretary.

MILWAUKIE, *September, 6, 1854.*

E 10.

Colonel Graham to the Committee of the Board of Trade of Milwaukee.

OFFICE GENERAL SUPERINTENDENCE OF
LAKE MICHIGAN WORKS,
Chicago, September 12, 1854.

GENTLEMEN: A slight illness, from which I am now relieved, prevented my replying to your letter, accompanying the resolutions of the Board of Trade of Milwaukee, (passed on the 5th instant,) at an

earlier moment than the present. I assure you, gentlemen, nothing could be more gratifying to me than to be able to meet your views in regard to the improvements you refer to at the entrance to your harbor; and I have written to Washington to know if it will be allowable under the law to expend a portion of the present appropriation in dredging the bar opposite the government piers and between those piers. I am not sure that the law does not limit the expenditure of this appropriation to the improvement at the "straight north cut" exclusively. Be assured, however, that I will do everything in my power for the security and improvement of your harbor. I am compelled to go immediately to attend the works on the east side of this lake, which will prevent my going, just now, to make a personal inspection of the obstruction you refer to; but this is the less necessary to a proper understanding of it, as a conversation I have lately had with Mr. Gunnison, the United States agent for Milwaukie harbor improvements, together with your own representation, conveys every requisite information to convince me that the obstruction ought to be removed as early as possible.

I am obliged to keep the United States dredge at work at Racine until the channel there is finished.

I remain, gentlemen, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Supt. Eng., &c., &c.

Hon. BYRON KILBOURN,

JOHN G. INBUSCH, Esq.,

Gen. S. B. GRANT,

Committee, &c., &c.

E 11.

Colonel Abert to Colonel Graham.

BUREAU OF TOPOGRAPHICAL ENGINEERS,

Washington, September 16, 1854.

SIR: Your letter, No. 43, of September 12, has been received, and will be submitted to the War Department. Should permission be given to use the dredge boat, as desired, at the mouth of the old harbor of Milwaukie, no expense can be met by the United States, as, by the existing law, the United States appropriation can be expended only at the north cut.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Major J. D. GRAHAM,

Corps Topographical Engineers,

Bvt. Lieut. Col. United States Army, Chicago, Illinois.

E 12.

Colonel Abert to the Secretary of War.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, September 16, 1854.

SIR: I submit for consideration a letter from Brevet Lieutenant Colonel J. D. Graham, of the 12th instant. The proposition is to have the Lake Michigan dredge boat employed at the (old pier) harbor of Milwaukee. I perceive no objection to permitting the boat to be so used, provided it be done under the direction of Brevet Lieutenant Colonel J. D. Graham, and provided all expense be furnished from other sources than the United States. The active use of the boat involves an expenditure of about \$1,500 a month.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,

Secretary of War.

Endorsement on the above.

“Approved, with the limitations proposed within.

“JEFF’N DAVIS,

“Secretary of War.

“WAR DEPARTMENT, September 16, 1854.”

E 13.

Colonel Graham to the Committee of the Board of Trade of Milwaukee.

OFFICE GENERAL SUPERINTENDENCE OF
LAKE MICHIGAN WORKS,
Chicago, September 27, 1854.

GENTLEMEN: I herewith enclose to you copies (marked E 11 and E 12) of communications I have this day received from Washington, in reply to my letter of the 12th instant to Colonel Abert, on the subject of the dredging you requested to be done at Milwaukee. You will perceive, by the endorsement of the honorable the Secretary of War, on the letter of Colonel Abert to him, of the 16th instant, that if the dredging goes on, it must be at an expense to be provided by the city authorities, or by others than the United States. Please communicate to me what action shall be taken on this point by those interested,

and if desired I will endeavor to have the steam dredge at your harbor when she has finished at Racine.

I am, very respectfully, gentlemen, your obedient servant,

J. D. GRAHAM,

Superintending Engineer Lake Michigan Works.

Hon. BYRON KILBOURN,

JOHN G. INBUSCH, Esq.,

General S. B. GRANT,

Committee, &c., &c., Milwaukie, Wisconsin.

E 14.

Colonel Graham to Agent Gunnison.—Instructions to survey Milwaukie harbor, &c.

OFFICE GENERAL SUPERINTENDENCE OF

LAKE MICHIGAN WORKS,

Chicago, September 19, 1854.

SIR: You will please make a survey of the harbor and river of Milwaukie and the adjacent lake coast, extending from a point two thousand feet above, or southward, from the present south pier, to a point two thousand feet northward of the position fixed for the proposed north pier of the straight cut. The shore of the lake should be carefully surveyed between these two extreme points in order to ascertain if there be any variation in it since your survey of last year. In the course of this survey permanent stakes should be driven at the distance of 250 or 300 feet apart, in order that lines of soundings may be extended from them out into the lake, until a depth of at least 20 feet water be reached. Throughout the extent of lake coast named above, there should be as near an uniformity as practicable in the multiplicity of soundings. They should be about as numerous throughout as those made by you last year, within the space 1,200 feet northward to 1,200 feet southward of the position for the straight cut.

It is reported that a shoal is forming off and within the entrance to the present harbor. The line of soundings should be so multiplied there as to show its exact extent and shape as accurately as possible.

Lines of soundings should be continued between the present piers and up the Milwaukie river as far as the mouth of the Menomonee, radiating from stations not more than 200* to 300 feet apart, to similar stations on the opposite side. The soundings should always be expressed in feet and tenths of a foot. The surveying chain and sounding pole and lines should be kept constantly tested by comparison with the standard rod furnished you. The positions and dimensions of all wharves and bridge piers within the scope of the survey should be correctly laid down, also the termination and width of those streets which extend to the lake shore within the limits of the survey. It is important that the position of the present light be given correctly. In sounding, the nature of the bottom should be noted at every

* Not more than 200 feet apart along between the present piers.

change, whether fine or coarse sand, gravel, clay or mud and recorded in place on the map.

When the survey is completed you will please forward the plot, with the note books, accompanied by a report, to this office. The uniform scale adopted for maps of this extent is 200 feet to 1 inch or $\frac{1}{2400}$.

I herewith enclose to you a draft on the United States depository at this place for two hundred dollars, on account of this survey and contingencies.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer.

H. W. GUNNISON, Esq.,

United States Agent, Milwaukie, Wisconsin.

E 15.

Agent Gunnison to Colonel Graham in regard to the condition of Milwaukie harbor.

MILWAUKIE, April 7, 1855.

SIR : I am requested by the harbor committee of the common council of this city to ascertain from you whether it will be possible to procure the government dredge this spring for the purpose of opening the channel at the present mouth of the river. I find, upon examination, that the channel is effectually closed to vessels drawing over $8\frac{1}{2}$ feet water, and although it will be partially dredged at once by Contractor Hawley, it will be impossible for him to effect anything more than a temporary passage.

While the deposits have increased at different points between the piers during the winter, it is found that the bar indicated by my survey of last October, southeast of the east end of the north pier, has diminished very considerably.

A few days' use of the United States dredge boat would be of immense service to Milwaukie.

Very respectfully, sir, your obedient servant,

H. W. GUNNISON.

United States Custodian.

E 16.

Colonel Graham to the Secretary of the Committee of the Board of Trade of Milwaukie.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, May 22, 1855.

SIR : I have never received an answer to my communication of the 27th of September last, addressed to the harbor committee, of which

you were a member, on the subject of the then proposed employment of the United States steam dredge in improving the channel and entrance to the present harbor of Milwaukee. Had I received any definite information that the necessary means for working the dredge had been provided by the city authorities, in accordance with the decision of the Secretary of War, I should have made arrangements to send the dredge to Milwaukee after completing the dredging in October last, at Racine. But nothing of the kind having been received from your committee, the dredge was sent to Kenosha. I suppose the dredging there will occupy about five weeks, and it is very desirable that if any definite action was taken on the Secretary's decision in regard to this matter, that the committee should communicate it to me, together with their views, as soon as practicable, for I must now, under several applications for the dredge, decide where she shall go when the dredging at Kenosha shall be finished.

I remain, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer.

S. B. GRANT, Esq.,

*Of the Committee of the Board of Trade
of Milwaukee, Wisconsin.*

E 17.

Colonel Graham to Agent Gunnison.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Detroit, May 29, 1855.

SIR: In your monthly reports of the progress of the work constituting the first, second and third sections, for the construction of the harbor and pier work at the straight cut at Milwaukee, over which your supervision was extended under the regulation of the War Department of June 4, 1853, it will be necessary that you should state the quantity of each description of work accomplished during the month, specifying the number of cubic yards excavated at the place marked out for the cut, the number of cribs that have been framed, and the number that have been sunk in position; also, if the work is going on in conformity with the demarcation on the ground made in May, 1854, and in accordance with the model and drawings that were sent to you from this office last year.

Any departure from these should be at once checked, and immediately reported to this office.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer, &c.

H. W. GUNNISON, Esq.,

United States Agent, Milwaukee, Wisconsin.

E 18.

*S. B. Grant, Esq., Secretary of the Committee of the Board of Trade,
to Colonel Graham.*

MILWAUKIE, *May 30, 1855.*

DEAR SIR: Yours of 22d instant reached here during my absence. Immediately upon my return, I laid it before the Board of Trade, who passed a resolution requesting the common council "to make immediate arrangements with Lieutenant Colonel Graham for the use of the government dredge on the terms prescribed by the Secretary of War."

A special meeting of the council is called on Thursday evening next to act on the resolution of the Board of Trade.

The dredge is much wanted here, and the funds for working it will be appropriated, I doubt not, at the next meeting of the council.

You will, I presume, receive a communication from that body within a very few days.

Very respectfully, yours, &c.,

S. B. GRANT.

Colonel . D. GRAHAM,
U. S. Top. Engineer Department, Chicago.

E 19.

Agent Gunnison to Colonel Graham.

OFFICE OF PUBLIC WORKS,
Milwaukee, June 2, 1855.

SIR: During the past month the city contractor has excavated about 2,400 yards of earth at the straight cut, working from the river towards the lake. The excavation now reaches about half way from the natural margin of the river to the lake shore. Mr. Hawley (the city contractor) has dredged but a small portion of the time during the last month, upon the new harbor, working very irregularly at that point and upon other jobs in the river as he can get them.

He has commenced the construction of three cribs for the harbor, each 100 feet long and 10 feet wide, and has as widely departed from the plans of the government, as shown by the model and drawings sent me, not only in the method of framing, but in the quality and kind of timber used. It seems to be his design to follow out the plans originally fixed upon by the city engineer, and to disregard the action of the common council, which placed the work under the charge of the government engineers, and substituted the plans of the latter for those of the former.

I have therefore addressed a letter of inquiry to the harbor committee of the common council, a copy of which I will enclose you with the reply as soon as received.

Ex. Doc. 16—15

It is quite probable that the contract with Mr. Hawley for building the harbor will be forfeited. I am informed that it is his intention to relinquish it unless he can get help from the city, which the contract does not provide for.

I am, very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

Lieutenant Colonel J. D. GRAHAM,
*Superintending Engineer, Public Works, &c.,
Chicago, Illinois.*

E 20.

Agent Gunnison to Colonel Graham.

MILWAUKIE, June 14, 1855.

SIR: I find upon measurement (agreeably to your instructions) of the larger stone of those delivered under the Sweet, Ives & Hawley contract, that none will probably exceed 2 feet 9 inches by 2 feet.

Mr. Hawley has assigned his contract for building the harbor, with the consent of the city—the common council voting to pay the additional sum of \$10,100 to the assignee, on the completion of the first three sections of the work by the 1st September, 1855.

Very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

Lieutenant Colonel J. D. GRAHAM,
*Superintending Engineer, Public Works, &c.,
Chicago, Illinois.*

E 21.

Agent Gunnison to Colonel Graham.

MILWAUKIE, July 2, 1855.

SIR: During the latter portion of the past month the works upon the new harbor, under the city contract, have been suspended by Mr. Hawley, owing to his alleged inability to proceed with the same. He has, in the mean time, been negotiating with the city for an assignment of his contract to a man who, for additional compensation from the city, proposes to resume the work at once.

If this proposition is not accepted it is probable that the work will have to be let again to the highest bidder. The city council appear to be very generally in favor of a strict adherence to the government plans on the part of the city contractor, whoever he may be.

Mr. James M. Ballentine has delivered 7,411 cubic feet of pine tim-

ber at the government buildings, near the mouth of the river, in accordance with his contract of April 2, 1855, and has my duplicate certificate for the same. The other certificate I enclose herewith.

Please send me some funds on account of Milwaukie harbor improvement, if convenient.*

I am, very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

Lieutenant Colonel J. D. GRAHAM,
*Superintending Engineer, Public Works, &c.,
Chicago, Illinois.*

E 22.

Colonel Graham's instructions to Agent Gunnison in regard to the plan for the Milwaukie piers.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, July 5, 1855.

SIR: Your letter of the 2d instant is just received, accompanied by your certificate of the pine timber delivered, on the 29th ultimo, by contractor James M. Ballentine, for Milwaukie harbor improvement.

Judging from your letter that some doubts exist as to whether the city council of Milwaukie will require a strict adherence on the part of the city contractor to the plans adopted by the United States superintending engineer for the crib-work, in their construction of the three sections of the piers at Milwaukie, and also as to whether your supervision, as United States agent, will be fully recognized over those three sections to be built by the city authorities, you will please address such a written communication to the council as may be necessary to elicit full information on these points, referring the council to their proceedings on the subject in the early part of May, 1854.

Should the council think proper to direct that the three city sections shall be constructed under your supervision as United States agent, and in accordance with the plans before mentioned, you will at once raise a working party of competent mechanics and laborers and go on with the dressing and framing the timber now on hand into cribs of a height that will come to the water level when sunk, to form the fourth or lakeward section to be constructed with the United States funds. The cribs forming the city sections, and the fourth or United States section, will all be built in strict conformity with the drawings herewith sent to you, which you will consider as the adopted models.†

The only exception will be in the size of the bolt iron used for the

* Funds were sent after the city determined to adhere to Colonel Graham's plans.

J. D. G.

† These drawings were copies of those shown on the accompanying sheet, marked G, No. 20, case 2d of crib-work. These were substituted instead of those previously sent, (as shown on sheet G, No. 19,) because the size of the ballast-stone at Milwaukie required larger interstices in the open latticed bottoms of the cribs.

J. D. G.

fourth section. The drawings specify bolt iron 1" by 1" square, as the adopted size, which will be adhered to unless the iron has already been procured of a larger size, as is the case for the fourth section. The iron having already been delivered for that section, of a round form $1\frac{1}{2}$ inch in diameter, it must be used in case Messrs. Sweet, Ives & Hawley get their accounts for this and the stone adjusted at the United States treasury in sufficient time not to keep you waiting, of which you will give them due notice without delay.

In case, however, the city council should not direct as above, you will withdraw from further connexion with their sections of the work, and will defer raising a working party for the construction of the fourth section, and report in detail to this office. The balance of the appropriation has been placed by the United States treasury at my disposal, in case the system above described is pursued in building this work. In case, however, the city declines pursuing it, I presume this balance will be put back into the treasury.

Under the orders of the department every economy must be used to save expense in going on with the harbor works.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel Superintending Engineer.

H. W. GUNNISON, Esq.,

U. S. Agent, Milwaukie, Wisconsin.

E 23.

Agent Gunnison to Colonel Graham.

MILWAUKIE, July 9, 1855.

SIR: I have the honor to acknowledge the receipt of your communication of the 5th instant. In accordance with your instructions, I have addressed a letter to the mayor and common council of the city of Milwaukie, asking their final determination as to the adopting of the government plans for the construction of the first three sections of the new harbor. My former communication of June 2, to the harbor committee, is also before them and, as I am informed, will be acted upon this evening.

I am also in receipt of your letter of the 6th instant, and of the package of blanks and the drawings of model for crib-work* (alluded to therein) per express.

I am, very respectfully, sir, your obedient servant,

H. W. GUNNISON,

United States Agent.

Lieut. Col. J. D. GRAHAM,

*Top'l Engineers, Sup'g Engineer, &c., &c.,
Chicago, Illinois.*

* These drawings were copies from those shown on the accompanying sheet G, No. 20, or case 2d of crib-work.

E 24.

*Agent Gunnison to Colonel Graham.*MILWAUKIE, *July 12, 1855.*

SIR: Mayor Cross assured me this morning that, at the next meeting of the common council, the United States plan for the construction of the harbor at this place will be adopted by the city, and that the other requirements of the government for the supervision of the work, &c., will be fully adhered to. I urged him very strongly to call a special meeting of the council, forthwith, in order that as little delay should occur as possible in the commencement of the work, and as the next regular meeting does not take place until the 19th or 20th instant.

I do not feel warranted, (under your instructions of the 5th instant,*) in organizing a working party until the definite and final action of the council in this matter.

I remain, very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

Lieut. Col. J. D. GRAHAM,
*Sup'g Engineer of Public Works, &c., &c.,
Chicago, Illinois.*

E 25.

*Agent Gunnison to Colonel Graham.*MILWAUKIE, *August 1, 1855.*

SIR: I have the honor to report that during the past month the city contractor has dredged and removed about 2,600 yards of earth from the site of the new harbor. No other work has been done by him during that time. The city council has not yet taken any action in relation to the plan or superintendence of the work, owing, as I am informed by the mayor, to the absence of the chairman of the harbor committee.

The members of the council profess to be in favor of a full compliance with the requirements of the government, but they are singularly negligent in permitting the best portion of the working season to pass away without taking the necessary steps for the prosecution of the work.

I remain, very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

Lieut. Col. J. D. GRAHAM,
*Superintending Engineer of Public Works,
Chicago, Illinois.*

* See E 22.

E 26.

Proceedings of the Common Council of Milwaukie, Wisconsin, directing the United States plans to be adhered to in the construction of the city sections of the harbor piers.

The harbor committee, to whom was referred the communication of H. W. Gunnison, esq., United States agent, and the letter of Lieutenant Colonel Graham, relating to the construction of the harbor at the straight cut,

Respectfully report, that whereas it appears from an estimate of the city engineer, made in accordance with a resolution of the common council instructing him to estimate the additional cost to the city of constructing said harbor on the plan adopted by the United States government, instead of that proposed by the city, which estimate is herewith submitted, and from which it appears that the additional cost will be about \$10,250; the committee believe it will be economy on the part of the city to construct said harbor on the government plan, as in that case it is understood the government will expend the balance of its appropriation for said work in the construction of the fourth or lakeward section, and may hereafter be induced to make further appropriations to repair or extend the same.

In order, therefore, to meet the views of the government and the proper officers in charge of said work, the committee recommend the adoption of the government plan for constructing the harbor at the straight cut, and that said work be done under the supervision of the United States agent, and for the purpose of carrying this recommendation into effect, the committee recommend the adoption of the following preamble and resolution, to wit:

Whereas, the contract of Abel Hawley with the city of Milwaukie to construct the harbor at the straight cut, and which by the consent of the city has been assigned to Mr. C. D. Barton, provided that the city may at its pleasure alter, modify, or change in whole or in any part, the plan of said work: *Provided*, That in case the cost of constructing said harbor shall be increased or diminished by reason of such change of plan, then the additional cost, if any, shall be paid by the city, or if the cost be less by reason of such change, then a corresponding deduction shall be made from his contract price, such increase or diminution of cost of work to be determined as provided in said contract, therefore,

Resolved, That the plan for constructing the harbor at the straight cut, as adopted by the United States government, be, and the same is hereby, adopted as the plan of the city for the same works, and Mr. C. D. Barton is hereby required and directed to construct said work on the government plan, under the supervision of the United States agent; and the city engineer is hereby directed to see that said work is so constructed, and to make his estimates for said work accordingly.

J. HADLEY,
JAS. LUDINGTON,
RICHARD HOUGHTON,
Committee.

The foregoing is a true copy of preamble and resolution adopted by
[L. S.] the common council of the city of Milwaukie, on the 6th day
of August, 1855.

R. WHITEHEAD, *City Clerk.*

For the purpose of officially acquainting the United States agent of
the action of the common council in relation to the construction of the
harbor at the straight cut, therefore,

Resolved, That a copy of the foregoing report and resolution be
signed by the mayor and clerk, and properly addressed to H. W.
Gunnison, esq., United States agent.

J. B. CROSS, *Mayor.*

R. WHITEHEAD, *City Clerk.*

E 27.

Instructions to the City Contractor.

OFFICE PUBLIC WORKS,
MILWAUKIE HARBOR IMPROVEMENT,
August 17, 1855.

SIR: In constructing and sinking the cribs for the pier work in the
lake you will please observe the following directions:

1. No crib should be sunk in less than six feet water, and the bed
or surface for the same should be made as nearly level as possible.

2. In case any rocks or obstructions of any kind are discovered,
which would interfere with the uniform settlement of the crib or cause
it to tilt, they should be removed before it is sunk in place.

3. Each crib should have at least one foot greater depth than the
water in which it is to be sunk, so that after being settled in place the
upper timbers will be accessible for the superstructure.

Very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

C. D. BARTON, Esq.,
City Contractor, Milwaukie.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, August 20, 1855.

Approved.

J. D. GRAHAM,
Lieut. Col., Superintending Engineer, &c., &c.

E 28.

*Agent Gunnison to Colonel Graham.*OFFICE MILWAUKIE HARBOR IMPROVEMENT,
September 1, 1855.

SIR: I have the honor to report, that during the past month I have been engaged with a small working party in framing the pine timber now on hand into cribs of the proper height for the outer section of the pier work on the new harbor; the construction of the inner section being provided for by the city contract. I was unable to hire the proper men at reasonable rates so as to commence the work until late in the month. Since that time we have framed one crib ready to be put together, and made some progress upon the second.

The city contractor since the adoption by the common council of those resolutions, a copy of which I gave you when last in Chicago, has commenced the work with a good deal of energy. He has constructed four cribs 32' $\times$ 20', each five timbers high for the outside work, to which it is the intention to add two timbers more before sinking them in place, as I have directed him by letter dated 17th ultimo, a copy of which is herewith sent, to sink no cribs in less than six feet water.

He has also four other cribs under way, some of them nearly completed. The work, as done thus far, I think, would meet your approval. Between 8,000 and 9,000 cubic yards of earth have been removed by the city contractor since the date of my last report.

I would beg leave to submit the following estimate of the amount of funds required for the month of September.

Labor for month of September.....	\$300
Labor for past month.....	100
Subsistence.....	75
Compensation of agent for September.....	120
“ “ in arrear.....	240
	835
Contingencies	100
	935

I am, very respectfully, sir, your obedient servant,

H. W. GUNNISON,
United States Agent.

Lieut. Col. J. D. GRAHAM,
Sup'g Eng., &c., Chicago, Illinois.

E 29 a.

*Agent Gunnison to Colonel Graham.*OFFICE MILWAUKIE HARBOR IMPROVEMENT,
October 1, 1855.

SIR: I have the honor to report that, during the past month, the following amount of timber has been framed for the crib-work of the fourth section of the new harbor, viz:

54 sticks, each 32 feet long, = 1,728 cubic feet.

27 sticks, each 20 feet long, = 540 do.

4 sticks, each 30 feet long, = 120 do.

1 stick, 25 feet long, = 25 do.

exclusive of the timber for a crib twelve feet high, specified in my report for August.

A large portion of the balance of the timber is counter hewed.

Since the date of my last report the city contractor has framed and put together—

8 cribs, 32' × 20', and five timbers high,

2 do. do. × do. and eight do. do.

1 do. do. × do. and seven do. do.

1 do. do. × do. and six do. do.

1 do. do. × do. and four do. do.

making thirteen framed during the month, or seventeen since the commencement of the work.

Most of the timber is framed for raising these cribs to a proper height.

Owing to the unusual inclemency of the season, the city contractor has commenced the construction of two temporary piers, ten feet wide, designing to extend them some 200 feet into the lake, on each side of the proposed opening, and to build a breakwater across the outer ends. In an ordinary season this work would hardly be necessary, but since the commencement of the work this season, there have hardly been twenty-four consecutive hours where either a dredge, scows, or cribs could be brought into the lake or worked on the outside without such protection.

I am very anxious to have as many cribs as possible put in place before the close of the season, that they may be thoroughly settled by exposure to the winter storms before the upper works are constructed.

4,500 cubic yards of earth have been removed by the city contractor during the past month.

I beg to submit the following estimate of funds required for the month of October at this place:

Labor for the month.....	\$300 00
Subsistence	75 00
Compensation of agent	120 00
Contingencies.....	100 00
	595 00

Brought forward.....	\$595 00
Deduct balance on hand.....	80 15 $\frac{3}{4}$
Amount required.....	514 84 $\frac{1}{4}$

I remain, very respectfully, your obedient servant,
H. W. GUNNISON,
United States Agent.

Lieut. Colonel J. D. GRAHAM,
*Superintending Engineer Public Works on
Lake Michigan, Chicago, Illinois.*

E 29 b.

Agent Gunnison to Colonel Graham.

OFFICE MILWAUKIE HARBOR IMPROVEMENT,
November 2, 1855.

SIR: I have the honor to report that, during the month of October past, the following amount of work has been done upon the harbor improvement at this place. For 4th section 46 32-foot sticks or 1,472 cubic feet; 50 20-foot sticks or 1,000 cubic feet; 6 30-foot sticks or 180 cubic feet, have been framed, being nearly the balance of the timber delivered by Ballentine in June last. On the 21st October, during a severe gale, Mr. Ballentine's vessel, loaded with the remaining portion of the timber contracted for, was wrecked at the mouth of the river; the captain, mate, and one hand drowned; the vessel entirely broken up, and the timber scattered in the lake. He has since gathered up what he could find of the timber and is now delivering it.

Since the date of my last report the city contractor has raised 14 of the cribs, previously commenced, eight timbers high, and built and sunk one crib 100 feet by 10, on the north side of the channel from the river to the lake. He has been employed a good portion of the time in the construction and sinking of the temporary breakwater in the lake, but has met with indifferent success, owing to the severe gales of the season; 250 feet upon the south side are completed. I fear that he will not succeed in placing any of the 20 foot cribs this fall. This I regret exceedingly, and have used my utmost endeavors to have a portion of them sunk before the close of the season.

I beg leave to call your attention to my estimate for funds required for month of October, accompanying my last monthly report..... \$514 84
To which add for November..... 450 00

964 84

Very respectfully, sir, your obedient servant,
H. W. GUNNISON,
United States Agent.

Lieut. Col. J. D. GRAHAM,
Supt'g Eng. Public Works, Chicago, Illinois

E 30.

Agent Gunnison to Colonel Graham.

OFFICE PUBLIC WORKS,
MILWAUKIE HARBOR IMPROVEMENT,
November 22, 1855.

SIR: Since the date of my last annual statement, I have the honor to report the following progress of the work at this place. On the 9th of May, 1854, the city authorities of Milwaukie, under an act of the State legislature, authorizing an appropriation for that purpose, let the contract for the building of the harbor at the site designated by the government appropriation of 1853 as the "straight cut," and ostensibly complied with the requirements of the decision of the honorable the Secretary of War, applicable to cases of joint expenditure of government and municipal or individual funds for public works, of date June 4, 1853. The contractor, however, proceeded but slowly upon the work of dredging during the summer of 1854, and in May of the present year (1855) signified his intention of abandoning the contract or of assigning it to other parties. An assignment was finally perfected in July 1855, (with the consent of the city,) to C. D. Barton, esq., by whom the work, during the remainder of the working season, has been prosecuted.

The contract provides for the construction of the pier work, the docking, and the dredging of the channel, from the river to a point 700 feet into the lake, which distance reaches a depth of 10.5 feet water; the work to be done in accordance with the government plan, and under the superintendence of the United States officer or agent in charge of the work at this place.

Up to the present time the city contractor has done the following work:

He has dredged and removed the earth from the navigable channel of the river to within about 25 feet of the margin of the lake, extending from the northern to the southern line of the proposed channel across the beach, making about 18,000 cubic yards of earth excavated during the present year. He has framed and sunk in place one crib of the following dimensions, viz: 100 feet long, 10 feet wide, and 12 feet high; said crib being for the protection of the channel from the river to the lake, and sunk upon the north side thereof.

He has also constructed 14 cribs 32 feet long by 20 feet wide and 8 feet high, and 3 more of the same description 6 feet high, none of which, however, have been sunk in place.

On the part of the United States government the following work has been done:

150	pieces	pine	timber	framed,	each	32' × 12" × 12",
185		do	do			20' × 12" × 12",
24		do	do			30' × 12" × 12",
3		do	do			25' × 12" × 12",

comprising the full amount of timber delivered by James M. Ballentine, under his contract of April 2, 1855. This timber is not put

together, but has been piled up on the margin of the river, near where it was framed, in a very convenient position for laying cribs.

I beg leave to make the following suggestions in relation to the construction of the harbor pier work above water. I find, on examination of pine timber used on the old harbor and in other places exposed to the action of both air and water, that it shows less, or at least no more, signs of decay than the oak timber used in similar situations; and I am told by men experienced in the use of the two kinds of timber, that they regard good pine as durable as oak (white) in this climate; while it has this advantage over the latter, that it can be obtained for from two to five cents per cubic foot less, and can be worked much easier. I would therefore suggest that it be used for the entire work, except for piles, wherever they may be required.

I submit the enclosed estimates for continuing the work upon the new harbor to completion.

Those on sheet "A"* are confined to the fourth or lakeward section of the work.

Those on sheet "B" comprise the first three sections now under contract, to be built by the city.

Those on sheet "C" are for the repairs of the present harbor entrance.

I remain, very respectfully, sir, your obedient servant.

H. W. GUNNISON,
United States Agent.

Lieut. Colonel J. D. GRAHAM,
Supt'g Eng. Lake Michigan Works, Chicago, Illinois.

E 31.

Estimate of the cost of completing the fourth section of Milwaukee harbor piers at the "north cut" commencing 704 feet from the lake shore, in 10 feet water, and extending to 1,024 feet from the lake shore, into 12 feet depth of water.—(See map G No. 16.) Length of section = 320 feet, which will require 10 cribs for each pier, or 20 cribs for both piers, each 32 feet long, 20 feet wide, of an average height of 12 feet below water and 5 feet above water.—Total height = 17 feet.

1. Estimated cost of one crib 32 feet long, 20 feet wide, and 17 feet high, according to case second of crib work shown on sheet G, No. 20.—(See preceding formula for computation.)

For 1,951 lineal feet of pine timber, hewn 1 foot square, at 16 cents per foot.....	\$312 16
For 880 lineal feet of white oak timber, hewn 1 foot square, at 18 cents per foot.....	158 40

* This is not herewith presented, as it was based upon a depth of 13 instead of 12 feet depth of water, and for a length of 256 feet instead of 320 feet for the fourth section. The estimate herewith presented, marked E 31, is substituted, being based on a depth of 12 feet water and 320 feet length of the fourth section, this being in accordance with the last survey, as shown on map G, No 16. J. D. G.

For 1,482 feet, board measure, of white oak plank 3" $\times$ 8", for flooring, at \$16 per M.....	\$23 71
For 2,660 pounds of 1 inch square wrought iron for bolts, at 4 cents per pound.....	106 40
For 137 pounds of wrought iron spikes, $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, at $7\frac{1}{2}$ cents per pound.....	10 28
For 53 cords of hard boulder stone for crib ballast, at \$8 per cord.....	424 00
Labor, carpentry, &c., and expense of floating out and fill- ing with stone.....	400 00
Add 10 per cent. for contingencies.....	143 50

Estimated cost of one crib..... 1,578 45

2. Then 20 cribs, at \$1,578 45 each.....	31,569 00
3. For dredging 6,163 cubic yards between the piers, at 20 cents per cubic yard	1,232 60

Total..... 32,801 60

From which deduct as follows:

Value of dressed timber on hand.....	\$3,150 40
Balance remaining on the 31st December, 1855, of former appropriation.....	7,144 70
	<u>10,295 10</u>

Amount of appropriation required to complete the fourth
section of the Milwaukie harbor, at the "north cut"... 22,506 50

J. D. GRAHAM,

Bvt. Lieut. Col., Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 32, or B.

Estimate of cost of the 1st, 2d, and 3d sections of the piers for Milwaukie harbor, at the "north cut," to extend 704 feet from the shore into the lake, or 22 cribs each 32 feet by 20 feet, with an average height of, below water, 10 feet; above water, 5 feet; = 17 feet average height from bottom to top.

The cost of each crib will be as follows:

29 pieces pine timber, 32' $\times$ 12" $\times$ 12" = 928 feet, at 16 cents per cubic foot.....	\$144 48
34 pieces pine timber, 20' $\times$ 12" $\times$ 12" = 680 feet, at 16 cents per cubic foot	108 80
2 pieces pine timber, 30' $\times$ 12" $\times$ 12" = 60 feet, at 16 cents per cubic foot.....	9 60

2 pieces pine timber, $12\frac{1}{2}' \times 12'' \times 6'' = 12\frac{1}{2}$ feet, at 25 cents per cubic foot.....	\$3 12 $\frac{1}{2}$
14 pieces white oak timber, $32' \times 12'' \times 12'' = 448$ feet, at 18 cents per cubic foot	80 64
15 pieces white oak timber, $20' \times 12'' \times 12'' = 300$ feet, at 18 cents per cubic foot.....	54 00
4 pieces white oak timber, $32' \times 12'' \times 6'' = 64$ feet, at 25 cents per cubic foot.....	16 00
1 piece white oak timber, $32' \times 12'' \times 9'' = 24$ feet, at 25 cents per cubic foot	6 00
1,482 feet, board measure, white oak plank, $19' \times 3''$ $\times 8''$, at \$16 per M.....	23 71
4 white oak piles, $24' \times 12'' \times 12'' =$ at \$2 50 each.....	10 00
32 cords of stone, at \$8 per cord.....	256 00
2,084 pounds 1 inch square bolt iron, at $4\frac{1}{2}$ cents per pound.....	93 78
126.35 pounds $6'' \times \frac{3}{8}'' \times \frac{3}{8}''$ spikes, at $7\frac{1}{2}$ cents per pound.....	9 48
Carpentry, labor, &c.....	314 50
Cost of 1 crib.....	1,130 11 $\frac{1}{2}$
22 cribs for the north pier, at \$1,130 11 $\frac{1}{2}$ each.....	24,862 53
22 cribs for the south pier, at \$1,130 11 $\frac{1}{2}$ each.....	24,862 53
Cost of north and south piers.....	49,725 06
98,935 cubic yards dredging, at 15 cents per cubic yard	14,840 25
Cost of north and south piers, and dredging the channel 12' deep between them.....	64,565 31
<i>Estimate for protecting north side of cut, 6 cribs $32' \times 10' \times 15'$.</i>	
30 pieces of pine, each $32' \times 12'' \times 12'' = 960$ feet, at 16 cents per cubic foot	\$153 60
55 pieces of pine, each $10' \times 12'' \times 12'' = 550$ feet, at 16 cents per cubic foot	88 00
2 pieces of pine, (floor,) $32' \times 12'' \times 6'' = 32$ feet, at 25 cents.....	8 00
14 cords of stone, at \$8 per cord.....	112 00
1,012 pounds 1 inch square bolt iron, at $4\frac{1}{2}$ cents per pound.....	45 54
741 feet plank, $9' \times 3'' \times 8''$, at \$16 per M.....	11 86
72 pound spikes, $6'' \times \frac{3}{8}'' \times \frac{3}{8}''$, at $7\frac{1}{2}$ cents per pound.....	5 40
4 piles of white oak, $24' \times 12'' \times 12''$, at \$2 50 each.....	10 00
Carpentry and labor.....	96 37 $\frac{1}{2}$
Cost of each crib.....	530 77 $\frac{1}{2}$

Cost of 6 cribs, for north side protection.....	\$3,184 65
Cost of 5 cribs, for south side protection.....	2,653 87½

Whole cost of protection to the two sides of the cut.....	5,838 52½
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Recapitulation of cost of the first three sections of harbor work, extending 704 feet from the shore into the lake—

Cost of north and south piers.....	\$49,725 06
Cost of protecting sides of cut.....	5,838 52½
Cost of dredging 12 feet deep between the piers	14,840 25

Whole cost of sections 1, 2, and 3, extending to 10½ feet water.....	70,403 83½
Deduct city appropriation.....	50,000 00

Remainder	20,403 83½
Add 10 per cent. of cost for contingencies.....	7,040 38

Balance required to complete the 1st, 2d, and 3d sections.....	27,444 21½
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H. W. GUNNISON,
United States Agent.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

Approved.

J. D. GRAHAM,
Lieut. Col., Sup'g Eng. of Lake Michigan Works.

E 33, or C.

Estimated cost of repairs of piers and improving channel of the present harbor at Milwaukie, Wisconsin.

1. *Cost of repairing of north pier.*

14,175 cubic feet pine or oak timber, in length not less than 30' for side pieces, &c., at 16 cents.....	\$2,268 00
260 ties 24' × 12" × 12" = 6,240 cubic feet, at 16 cents per cubic foot.....	998 40
210 ties 20' × 12" × 12" = 4,200 cubic feet, at 16 cents per cubic foot.....	672 00
7,984 pounds 1 inch square bolt iron, at 4¼ cents per pound	359 28
52,000 feet 3 inch plank, at \$16 per thousand feet.....	832 00
1,460 pounds 6" × ¾" × ¾" spikes, at 7½ cents per pound	109 50
100 cords of stone, at \$8 per cord.....	800 00
Carpentry and labor.....	2,461 00

Estimated cost of repair of the north pier.....	8,500 18
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2. *Cost of repair of south pier.*

9,750 feet 12" $\times$ 12" pine or oak timber, in length not less than 30 feet, for side pieces, at 16 cents per cubic foot.....	\$1,580 00
150 ties 20' $\times$ 12" $\times$ 12" = 3,000 feet, at 16 cents per cubic foot.....	480 00
175 ties 18' $\times$ 12" $\times$ 12" = 3,150 feet, at 16 cents per cubic foot.....	504 00
4,664 pounds 1 inch square bolt iron, at 4½ cents per pound	209 88
80 cords of stone, at \$8 per cord.....	640 00
27,500 feet 3 inch plank, at \$16 per thousand feet.....	440 00
672 pounds 6" $\times$ ¾" $\times$ ¾" spikes, at 7½ cents per pound	50 40
Carpentry and labor... ..	1,570 00
Estimated cost of repairing the south pier.....	5,474 28

RECAPITULATION.

Estimated cost of repairing north pier.....	\$8,500 18
Estimated cost of repairing south pier.. ..	5,474 28
38,238 cubic yards of dredging, at 20 cents per yard.	7,647 60
Total	21,622 06
Add 10 per cent. for contingencies.....	2,162 20
Total required for repairs and improvement of old harbor	23,784 26

H. W. GUNNISON,
United States Agent.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

Approved.

J. D. GRAHAM,
Lieutenant Colonel, Superintending Engineer, &c.

E 34.

Estimate of the cost of meteorological instruments necessary for observations at Milwaukie harbor, Wisconsin.

For 1 syphon barometer, by James Green, of New York.....	\$35 00
For 1 standard thermometer, to be graduated from 240° above to 42° below zero, of Fahrenheit.....	7 50
For 1 anemometer, or wind gauge, (best construction).....	65 00
For 1 rain gauge, (best description).....	22 50

For 1 electrometer, to denote the electric state of the atmosphere. (This instrument is peculiarly necessary in this climate, in aid of investigations of the causes of sudden rises and falls of the surface of the lake).....	\$35 00
For 1 cyanometer.....	10 00
For 1 hygrometer.....	5 00
For 1 photometer.....	17 50
For 1 geo-thermometer.....	10 00
For 1 sympiesometer, (to measure accurately the force of storms).....	25 00
Amount required.....	<u>232 50</u>

J. D. GRAHAM,

*Brevet Lieutenant Colonel, Superintending Engineer.*OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
*Chicago, December 31, 1855.**Recapitulation of estimated amounts required for Milwaukie harbor.*

Estimate E 31.—To complete the 4th or United States section of the piers at the “north cut,” in addition to materials and balance of former appropriation on hand.....	\$22,506 50
Estimate E 32.—To complete the 1st, 2d, and 3d sections of the same piers, in addition to the city appropriation.....	27,444 21
Estimate E 33.—For the repair of the old harbor at the mouth of Milwaukie river.....	23,784 26
Estimate E 34.—For a set of meteorological instruments	232 50
Amount required for Milwaukie harbor, Wisconsin, in addition to the amount on hand.....	<u>73,969 47</u>

J. D. GRAHAM,

*Maj. Top. Eng., Bvt. Lieut. Col., &c., &c.*OFFICE OF GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

E 35.

Statement of the amount of duties collected at the port of Milwaukee, State of Wisconsin, on foreign merchandise, from January 1, 1855, to December 31, 1855, showing also the enrolled tonnage of this district on December 31, 1855, as appears on the records of the custom-house, and showing the number of arrivals and departures at the port of Milwaukee from March 1, 1855, to December 31, 1855

Amount of duties received each month from January 1, 1855, to December 31, 1855.		Enrolled tonnage, December 31, 1855.	No. of barques enrolled.	No. of brigs enrolled.	No. of schooners enrolled.	No. of steamers enrolled.	No. of sloops and scows enrolled.	No. of arrivals and departures at the port of Milwaukee, from March 1, 1855, to December 31, 1855.	Tonnage of vessels arriving and departing in said period.	Average number of arrivals and departures daily in said period.	Average amount of tonnage daily arriving and departing in said period
January	\$11,259 90	Tons. 95ths. 18,229 76	2	9	81	1	6	.....	1,481,400	16½	4,841
February.....	11,702 60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March.....	5,765 50	.....	.....	.....	.....	.....	.....	50	.....	.....	.....
April.....	918 00	.....	.....	.....	.....	.....	.....	332	.....	.....	.....
May.....	20,687 40	.....	.....	.....	.....	.....	.....	654	.....	.....	.....
June.....	13,025 80	.....	.....	.....	.....	.....	.....	692	.....	.....	.....
July.....	19,221 90	.....	.....	.....	.....	.....	.....	734	.....	.....	.....
August.....	9,138 80	.....	.....	.....	.....	.....	.....	638	.....	.....	.....
September.....	12,645 30	.....	.....	.....	.....	.....	.....	616	.....	.....	.....
October.....	16,203 20	.....	.....	.....	.....	.....	.....	692	.....	.....	.....
November	27,093 00	.....	.....	.....	.....	.....	.....	480	.....	.....	.....
December.....	25,468 60	.....	.....	.....	.....	.....	.....	116	.....	.....	.....
Total.	173,130 00	.....	.....	.....	.....	.....	.....	5,004	.....	.....	.....

The duties paid on merchandise transported in bond from other districts.....	\$137,775 20
Add duties on imports first landed at this port.....	35,354 80
Total.....	173,130 00

JOHN WHITE, Collector.

DISTRICT OF MILWAUKIE, Custom-house, December 31, 1855.

Submitted, with my annual report of this date, to the Topographical Bureau.

J. D. GRAHAM,
Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

E 36.

Statement of the quantity and value of articles of merchandise received by lake shipment at the port of Milwaukee, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....barrels..	51,523	\$2 31 $\frac{1}{4}$	\$119,147 00
Axes.....boxes..	3,475	10 00	34,750 00
Bark.....cords..	2,860	5 62 $\frac{1}{2}$	16,087 50
Bulk barrels, furniture, &c.....tons...	10,000	10 00	100,000 00
Candy.....boxes..	1,992	3 00	5,976 00
Candles.....do....	12,000	8 00	96,000 00
Cheese.....pounds..	383,500	11	42,185 00
Cider and vinegar.....barrels..	3,000	4 00	12,000 00
Coal.....tons...	74,841	4 50	336,784 50
Codfish.....boxes..	9,000	12 00	108,000 00
Coffee.....bags...	33,700	15 00	505,500 00
Dried apples.....bushels..	13,432	1 62 $\frac{1}{2}$	21,827 00
Dried peaches.....do....	10,346	3 00	31,038 00
Glass.....boxes..	25,442	2 50	63,605 00
Horses.....number..	2,263	80 00	181,040 00
Iron, in bars and pigs.....tons...	5,465	60 00	327,900 00
Iron, railroad.....do....	13,992	60 00	839,520 00
Laths.....M....	17,850	4 50	80,325 00
Leather.....rolls...	4,900	60 00	294,000 00
Liquors, high wines.....barrels..	15,534	15 00	233,010 00
Lumber, joists, &c.....M feet..	63,300	16 00	1,008,000 00
Mackerel.....barrels..	2,100	8 00	16,800 00
Merchandise, as boxes and packages, not otherwise mentioned.....tons...	73,530	136 00	10,000,000 00
Molasses and syrup.....barrels..	19,436	15 00	291,540 00
Nails.....kegs...	32,326	4 00	129,304 00
Oils.....barrels..	63,000	40 00	252,000 00
Peaches.....baskets..	4,500	3 00	13,500 00
Plaster.....barrels..	5,800	3 00	17,400 00
Raisins.....boxes and kegs..	36,500	3 02 $\frac{1}{2}$	110,412 50
Rice.....tierces..	338	27 00	9,126 00
Salæratius.....boxes..	8,674	2 50	21,685 00
Salt.....barrels..	74,592	1 75	130,536 00
Salt.....sacks..	122,000	13	15,860 00
Shingles.....M....	16,200	3 75	60,750 00
Shingle bolts.....cords..	1,000	16 00	16,000 00
Soap.....boxes..	25,000	2 00	50,000 00
Starch.....do....	8,000	2 50	20,000 00
Steel.....tons...	200	145 00	29,000 00
Stoves.....number..	22,222	11 25	250,000 00
Sugar.....barrels..	30,600	18 00	550,800 00
Sugar.....hogsheads..	21,000	70 00	1,470,000 00
Tea.....chests..	22,700	22 00	499,400 00
Timber, square.....M feet..	150	10 00	1,500 00
Tobacco.....pounds..	1,400,000	12	168,000 00
Wagons.....number..	2,500	90 00	225,000 00
White lead.....kegs...	22,000	2 50	55,000 00
Total			18,860,298 50

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 37.

Statement of the quantity and value of articles of merchandise received at the port of Milwaukee, State of Wisconsin, by the Milwaukee and Watertown Railroad, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Ashes.....barrels..	168	\$12 00	\$2,016 00
Barley.....bushels..	12,926	1 00	12,926 00
Beans.....do.....	763	1 50	1,144 50
Butter.....firkins..	651	8 00	5,208 00
Charcoal.....bushels..	1,490	4	59 60
Corn.....do.....	2,160	60	1,296 00
Flour.....barrels..	38,080	8 00	304,640 00
Flour.....sacks..	6,725	4 00	26,900 00
Eggs.....barrels..	215	15 00	3,225 00
Grass seed.....bushels..	3,351	2 25	7,534 75
Hams.....barrels..	375	17 00	6,375 00
Hides.....number..	16,410	6 00	98,460 00
High wines.....barrels..	75	15 00	1,125 00
Hogs.....number..	7,019	12 50	87,737 50
Lard.....barrels..	25	20 00	500 00
Linseed oil.....do.....	20	50 00	1,000 00
Oak and cherry lumber.....feet...	52,000	40 00 per M.	2,080 00
Oats.....bushels..	2,016	40	806 40
Pig iron.....tons...	305	35 00	10,675 00
Pork.....barrels..	1,154	15 00	17,310 00
Potatoes.....bushels..	17,064	45	7,678 80
Rags.....pounds..	17,508	4	700 32
Rye.....bushels..	6,270	90	5,643 00
Tallow.....barrels..	16	12 00	192 00
Wheat.....bushels..	595,629	1 65	982,787 85
Wool.....pounds..	70,130	38	26,649 40
Total value of merchandise received at Milwaukee, by the Milwaukee and Watertown Railroad, in the year 1855.....			1,614,675 12

Opened in December, 1854, 32 miles, and on October 1, 1855, 45 miles.

J. D. GRAHAM,
Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855

E 38.

Statement of the quantity and value of articles of merchandise received at the port of Milwaukee, by the La Crosse and Milwaukee Railroad, during the months of October, November, and December, 1855.

Articles.	Quantity.	Price of each.	Value.
Barley. bushels..	16,218	\$1 00	\$16,218 00
Bar iron. pounds..	5,669	3 $\frac{3}{4}$	212 58
Beer. barrels..	94	10 00	940 00
Butter. pounds..	23,537	20	4,707 40
Corn. bushels..	132	60	79 20
Eggs. barrels..	274	15 00	4,110 00
Empty barrels. number..	340	1 00	340 00
Flour. barrels..	9,569	8 00	76,552 00
Grass seed. bushels..	161	2 25	362 25
Hides. pounds..	19,123	6	1,147 38
Hops. do.	2,000	12	240 00
Horses. number..	9	100 00	900 00
Lard. pounds..	3,948	10	394 80
Lumber. feet..	34,500	16 00 per M..	552 00
Machinery. pounds..	3,830	10 00 per 100..	383 00
Merchandise. do.	14,702	50	7,351 00
Oats. bushels..	1,319	40	527 60
Pig iron. pounds..	292,000	2	5,840 00
Pork. barrels..	136	15 00	2,040 00
Pork. pounds..	97,443	5	4,872 15
Potash. barrels..	1,822	12 00	21,864 00
Potatoes. bushels..	2,815	60	1,689 00
Rye. do.	2,928	90	2,635 20
Sundries. pounds..	77,743	50	38,871 50
Wheat. bushels..	89,843	1 65	147,910 95
Total value of merchandise received by the Milwaukee and La Crosse Railroad in the year 1855.			340,740 01

This road was opened 30 miles in August, 1855, 40 miles in October, and 51 miles in December, 1855. Will be completed to Portage, on the Wisconsin river, 112 miles, in 1856.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 39.

Statement of the quantity and value of articles of merchandise received at the port of Milwaukee, by the Milwaukee and Mississippi Railroad, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beef cattle.....number..	9,026	\$40 00	\$361,040 00
Barley.....bushels..	19,542	1 20	23,450 40
Beans.....do.....	1,864	2 00	3,728 00
Broom corn.....pounds..	260,934	2½	6,523 35
Butter.....kegs.....	1,491	10 00	14,910 00
Corn.....bushels..	103,659	60	62,194 40
Cranberries.....barrels..	30	10 00	300 00
Eggs.....do.....	638	15 00	9,570 00
Flour.....do.....	55,810	8 00	446,480 00
Grass seed.....bushels..	3,995	2 25	8,988 75
High wines.....barrels..	2,646	15 00	39,690 00
Hides.....pounds..	324,320	6	19,359 20
Hops.....do.....	39,580	12	4,749 60
Lard.....do.....	163,886	10	16,388 60
Lead.....do.....	7,630	6	457 80
Linseed oil.....barrels..	17	40 00	680 00
Lumber.....M feet..	132	16 00	2,112 00
Merchandise.....tons..	253	500 00	126,500 00
Mill feed.....do.....	131	20 00	2,620 00
Oats.....bushels..	59,259	40	23,703 60
Packing barrels.....number..	422	1 00	422 00
Pork.....barrels..	5,200	15 00	78,000 00
Pork.....pounds..	5,755,216	5	287,760 80
Potatoes.....bushels..	33,033	65	21,470 85
Rye.....do.....	25,979	90	23,381 10
Tobacco.....pounds..	22,550	20	4,510 00
Shot.....do.....	160,844	10	16,084 40
Staves.....M.....	395	15 00	5,925 00
Sundries.....pounds..	1,971,243	25	492,810 75
Wheat.....bushels..	1,931,409	1 65	3,186,824 85
Wool.....pounds..	307,077	38	116,689 26
Total value of merchandise received at Milwaukee, by the Milwaukee and Mississippi Railroad, in the year 1855.....			5,407,324 71

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 40.

Statement of the quantity and value of articles of merchandise shipped by lake vessels from the port of Milwaukee, Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Ashes ----- casks -----	3,500	\$25 00	\$87,500 00
Bacon ----- pounds -----	1,170,000	8½	99,450 00
Barley ----- bushels -----	92,291	1 20	110,749 20
Beans ----- do -----	1,818	2 75	4,999 50
Beef ----- barrels -----	9,976	12 00	119,712 00
Beer ----- do -----	10,255	10 00	102,550 00
Brick ----- M -----	6,500	10 00	65,000 00
Broom corn ----- bales -----	500	9 00	4,500 00
Butter ----- pounds -----	450,000	16	72,000 00
Candles ----- boxes -----	5,000	1 37½	6,875 00
Corn ----- bushels -----	117,000	60	7,020 00
Cranberries ----- do -----	500	4 00	2,000 00
Farina wheat -----			500 00
Feed ----- bushels -----	8,000	2 00	16,000 00
Fish ----- barrels -----	2,140	8 00	17,120 00
Flour ----- do -----	192,661	8 00	1,541,288 00
Glue ----- do -----	175	16 00	2,800 00
Grass seed ----- pounds -----	365,000	6¼	22,812 50
Hams and shoulders ----- do -----	3,704	8½	314 84
Hides ----- number -----	15,000	4 00	60,000 00
Hops ----- pounds -----	40,000	12½	5,000 00
Lard ----- barrels -----	4,423	22 00	97,306 00
Lard ----- kegs -----	501	11 00	5,511 00
Leather ----- pounds -----	125,473	50	62,736 50
Lime ----- barrels -----	10,418	1 50	15,627 00
Malt ----- bushels -----	17,925	1 50	26,887 50
Eggs ----- barrels -----	250	15 00	3,750 00
Merchandise ----- tons -----	10,300	500 00	5,150,000 00
Merchandise and fruit, not enumerated above ----- tons -----	3,000	100 00	300,000 00
Oats ----- bushels -----	24,000	45	10,800 00
Packing barrels ----- number -----	5,000	1 37½	6,875 00
Pig iron ----- tons -----	616	37 00	22,792 00
Pork ----- barrels -----	36,546	17 87½	653,259 75
Potatoes ----- bushels -----	44,703	65	29,057 00
Provisions, merchandise, &c., to lumber region -----			500,000 00
Rye ----- bushels -----	61,646	1 00	61,646 00
Shot ----- pounds -----	55,033	4	2,201 32
Soap ----- boxes -----	4,157	2 50	10,392 50
Staves ----- number -----	700,978	\$15 per M.	10,515 00
Sundries ----- packages -----	12,000	23 00	276,000 00
Tobacco ----- pounds -----	125,000	25	31,250 00
Vinegar ----- barrels -----	700	8 00	5,600 00
Wheat ----- bushels -----	3,008,966	1 65	4,964,793 90
Whiskey ----- barrels -----	1,805	17 00	30,685 00
Wool ----- pounds -----	625,280		237,606 40
Total value of merchandise shipped by lake vessels from Milwaukee in the year 1855 -----			14,863,482 91

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 41.

Statement of the quantity and value of articles of merchandise forwarded from the port of Milwaukee, by the La Crosse and Milwaukee Railroad, for the months of October, November, and December, 1855.

Articles.	Quantity.	Price of each.	Value.
Agricultural implements ----- pounds--	35,100	\$0 15	\$5,265 00
Apples ----- barrels--	1,607	2 50	4,017 50
Bar iron ----- pounds--	66,600	3 $\frac{3}{4}$	2,497 50
Beer ----- barrels--	9	10 00	90 00
Brick ----- M--	50	10 00	500 00
Butter ----- pounds--	1,400	20	480 00
Coal ----- tons--	9 $\frac{1}{2}$	7 00	66 50
Empty barrels ----- number--	1,222	1 00	1,122 00
Leather ----- pounds--	87,936	35	30,777 60
Liquor ----- kegs--	46	5 00	230 00
Lumber ----- M feet--	155 $\frac{1}{2}$	16 00	2,488 00
Machinery ----- 100 pounds--	2,416	10 00	24,160 00
Merchandise ----- pounds--	14,702	50	7,351 00
Oats ----- bushels--	1,011	40	404 40
Pig iron ----- pounds--	10,500	1 $\frac{3}{4}$	183 75
Salt ----- barrels--	2,438	1 75	4,256 50
Shingles ----- M--	78	3 50	273 00
Stone ----- tons--	72	20 00	1,440 00
Stoves ----- pounds--	237,520	10	23,752 00
Sundries ----- do--	2,065,926	50	1,032,963 00
Whiskey ----- barrels--	675	12 00	8,100 00
Wool ----- pounds--	1,600	38	608 00
Total value of merchandise exported from Milwaukee, by the La Crosse and Milwaukee Railroad, in the year 1855 -----			1,151,025 75

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 42.

Statement of the quantity and value of articles of merchandise forwarded from the port of Milwaukee, by the Milwaukee and Mississippi Railroad, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels.	22,362	\$2 50	\$55,905 00
Brick ----- M.	934	10 00	9,340 00
Coal ----- tons.	1,642½	7 50	12,318 75
Beef cattle ----- number.	584	40 00	23,360 00
Iron ----- tons.	1,568½	60 00	94,110 00
Laths ----- M.	3,035	2 50	7,587 50
Lime ----- barrels.	1,879	1 50	2,718 50
Lumber ----- M feet.	23,026	16 00	368,416 00
Packing barrels ----- number.	34,240	1 00	34,240 00
Pickets ----- M.	19	17 50	332 50
Posts ----- cords.	289	20 00	5,780 00
Merchandise ----- pounds.	27,580,378	25	6,895,094 25
Salt ----- barrels.	17,573	1 75	30,752 50
Shingles ----- M.	9,407	4 00	37,628 00
Stoves ----- number.	9,351	10 00	93,510 00
Sundries ----- pounds.	14,807,345	25	3,701,836 25
Whiskey ----- barrels.	3,950	12 00	47,400 00
Total value of exports from Milwaukee, by the Milwaukee and Mississippi Railroad, in the year 1855 -----			11,420,329 25

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 43.—*Statement of the manufactures at Milwaukee, State of Wisconsin, for the year ending December 31, 1855.*

Articles.	Quantity.	Value.
Ale and beer ----- barrels--	50,578	\$431,710 00
Brick ----- M-----	25,650	164,850 00
Barrels, (flour, pork, and whiskey) -----		112,500 00
Boots and shoes -----		185,350 00
Burr millstones -----		12,000 00
Bookbinding -----		22,000 00
Bedsteads and wood turnings -----		35,000 00
Bread and cracker bakeries -----		120,000 00
Brooms, (1 factory) -----		6,616 00
Billiard tables -----		42,000 00
Boneblack and grease, (1 factory) -----		4,000 00
Brass, ivory, and wood turning, of which there are several small establishments not included in the foregoing -----		5,000 00
Baking powder, (1 factory) -----		3,000 00
Clothing -----		318,500 00
Cabinet furniture -----		187,200 00
Confectionery -----		20,000 00
Carriages -----		21,000 00
Caps, hats, and furs -----		30,000 00
Camphene and burning fluid -----		9,391 00
Cow-bells, (1 factory) -----		800 00
Cigars and tobacco -----		45,652 00
Drugs, paints, patent medicines, &c. -----		5,500 00
Daguerrean and photographs -----		23,500 00
Engraving and lithographing -----		6,000 00
Flour ----- barrels--	106,500	852,000 00
Guns and pistols -----		6,500 00
Glue, (1 factory) -----		10,000 00
Gas ----- cubic feet--	11,016,252	38,556 00
Gloves and mits -----		6,500 00
Harness, carriage trimming, saddlery, and trunks -----		75,000 00
Horse-shoeing, and other smith's work not enumerated in the foregoing -----		30,000 00
Iron manufactured, machinery, locomotives, stationary engines, and various other castings -----		532,788 00
Jewelry, silver and plated ware -----		15,000 00
Job printing -----		31,975 00
Lumber planing, sash and door factories -----		175,300 00
Lime ----- barrels--	60,000	45,000 00
Matches, (1 factory) -----		38,000 00
Marble cutting, (1 yard) -----		7,000 00
Maps, charts, &c. -----		6,000 00
Millinery establishments -----		41,200 00
Other miscellaneous articles, (belonging to the items iron, &c.,) not enumerated in that item -----		150,000 00
Pails and tubs, (1 factory, 9 months in operation) -----		14,657 00
Pianofortes -----		8,500 00
Pork and beef packing ----- barrels--	43,404	564,252 00
Paper, (1 manufactory) -----		50,183 00
Patent machine factory -----		15,000 00
Patent safe, (1 factory) -----		15,000 00
Ploughs -----		4,000 00
Plane factory -----		2,000 00
Rectified spirits and cordials -----		8,000 00
Railroad passenger-cars -----		10,000 00
Sheepskins, morocco, &c., (tanned) -----		42,000 00
Sheet-iron, tin, and copper manufactures -----		125,000 00
Stone and earthen ware -----		16,000 00

E 43--Continued.

Articles.	Quantity.	Value.
Soap, wine, and candle boxes, (1 factory).....		\$6,600 00
Soap and candles.....boxes..	30,350	121,400 00
Stone cutters, (2 yards).....		6,000 00
Ship building.....		200,000 00
Stoves and hollow ware.....		20,000 00
Starch, (1 factory).....		10,000 00
Salæratius, (1 factory).....tons...	260	26,000 00
Shingles.....number..	2,000,000	81,000 00
Root beer factory.....		6,000 00
Tannery.....		75,000 00
Threshing machines, straw-cutters, wagons, and trucks.....		120,000 00
Umbrellas, &c.....		1,000 00
Vinegar, (3 factories).....barrels..	2,000	4,500 00
Wire screening.....		10,000 00
Wool and yarn, (1 factory).....		31,200 00
Whiskey.....barrels..	22,172	283,732 00
Window shades.....		3,000 00
Total value of the manufactures at Milwaukie in the year 1855.....		5,752,412 00

That is to say, five million seven hundred and fifty-two thousand four hundred and twelve dollars.

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

E 44.

REGULATION.

WAR DEPARTMENT,

Washington, June 4, 1853.

In every case where money is furnished by a State, city, association, or individuals, in order that the same may be expended in the further prosecution of a work of harbor and river improvement, to which Congress has given its sanction by a special appropriation, and it shall be requested by the authorities, or persons having charge of such money, that the officers of engineers in charge of such work shall be allowed to continue the operations in conformity with the plans and designs adopted by the War Department to the extent the money so provided will permit, the officer of engineers (or other agent of the general government) may be instructed to comply with the request under the following conditions:

1. The officer or agent to have no connexion with, nor responsibility for, the disbursement of the money so furnished, further than that he may give, from time to time, in compliance with any bargain or contract made under any such provision of money, a statement of the amount of work done or materials supplied.

2. It must be perfectly understood by the authorities or persons supplying money, in every such case, that the direction or supervision by the government officer or agent of the operations so carried on, is not to constitute nor to imply any claim or shadow of claim on Congress for reimbursement nor is to be considered as pledging the general government to any support of that particular work or improvement beyond that already given by Congress.

JEFF'N DAVIS,
Secretary of War.

6.—SHEBOYGAN HARBOR, WISCONSIN.

This harbor was one of the first to receive my special personal attention after my assignment to duty as the superintending engineer of the Lake Michigan harbor works. It was on the 20th of April, 1854, that I entered upon these duties, and on the 26th of that month, having in the meantime completed the necessary examinations of Milwaukie harbor, I made a minute examination of the piers and of the condition of Sheboygan harbor. I personally sounded out the channel between the piers and over the bar, and found not less than $8\frac{1}{2}$ feet on any part of the bar at the harbor entrance. The $8\frac{1}{2}$ feet bar was very narrow, and but little dredging was necessary to give a clear channel of 10 feet over the bar and all the way up between the piers. These piers are not the property of the United States. They were built out of a fund raised by the people of the city and county of Sheboygan. The condition of these piers were fully stated in my reports to the bureau, (Nos. 2 and 32,) the first mentioned dated May 1, 1854, and the other August 19, 1854.—(See F 1 and F 13, hereto attached.)

A full account of all my proceedings in relation to this harbor is set forth in the accompanying documents, marked from F 1 to F 30, inclusive. It will there be seen that, although an appropriation was made by Congress in the year 1852 for its improvement, yet it could not, under an existing law, be expended for that purpose until the removal of an impediment in regard to a proper title to the United States, conveying the possession and jurisdiction over the site for the construction of the work. Supposing that deeds of conveyance to the United States from the present proprietors of the existing piers would be sufficient to remove all impediments, and thus allow the appropriation to be expended in the further improvement of this harbor, this course was adopted, and the deeds from the city and county authorities, hereto attached, marked F 15 and F 16, were duly executed and placed at my disposal. They were transmitted to the Topographical Bureau with my report No. 37, of September 9, 1854, hereto attached, marked F 14. The decision upon them was, that the War Department had no authority to accept the cession of jurisdiction over the piers erected by the town or other corporate authorities.* Under this decision I could not lawfully expend the appropriation upon the

* See F 17, and the endorsement thereon.

general repairs of the Sheboygan piers, because they did not become the property of the United States. I was confined in the operations here to the mere adjustments of the extremities of the two piers, so as to place them in a proper condition for the commencement of an extension of them by the United States whenever such a step should be decided on. My instructions to Agent Newland, of September 29, 1854, (See F 23, hereto attached,) were therefore confined to that object.

The decision of the bureau (see F 30) upon the proposition contained in my report No. 88, of June 24, 1855, hereto attached, marked F 29, added to the previous decision of the War Department, (see F 17,) leaves me no ground for expending any part of the government appropriation upon the Sheboygan piers, or in extending them further out into the lake, unless legislation by Congress shall specially authorize the acceptance by the United States of the cessions of jurisdiction proffered, as shown by accompanying documents, marked F 15 and F 16. I presume, however, that it will be lawful to expend a portion of the government appropriation in deepening the channel over the bar and between the piers by dredging; and I propose to do so the ensuing season if it meet the approbation of the bureau and the War Department.

The river being a public highway, navigable for vessels of over 20 tons, and hence being under the jurisdiction of the United States for all purposes connected with the general commerce of the country, and dredging being one of the objects provided for or contemplated in the act of appropriation, I suppose there can be no objection under the laws to the dredging.

Sheboygan is a port of delivery for foreign importations. There is a deputy collector of custom duties stationed here. The port belongs to the district of Milwaukee. There is a coast light-house situated about a mile northward of the harbor entrance on the elevated bank of the lake shore.

The accompanying statement, marked F 32, shows that the enrolled tonnage belonging to this port on the 31st of December, 1855, consisted of one brig and three schooners, measuring, all together, 577 tons.

The number of arrivals and departures to and from this port, from March 1 to December 31, 1855, was 1,598; or an average per day, during that period, of 5.

The total amount of tonnage which arrived and departed during that period was 489,600 tons; or an average per day, during that period, of 1,800 tons.

It consisted of vessels of from 10 to 450 tons burden.

The amount of duties collected on foreign importations at this port, during the year 1855, (see F 32,) was \$3,975 60.

The value of the imports, both domestic and foreign, at this port during the year 1855 was, as per detailed statement hereto attached, marked F 33.....	\$6,749,461
The value of the exports from this port during the year 1855 was, as per statement F 34.....	1,003,564

Total value of imports and exports of Sheboygan in 1855 7,753,025

That is to say, seven million seven hundred and fifty-three thousand and twenty-five dollars.

The value of the portion of the above imports which passed over St. Clair flats in coming to Sheboygan, as shown in detail by the accompanying statement, marked F 35, was..... \$5,159,598

The value of the portion of the above exports which passed over St. Clair flats in going from Sheboygan in 1855, as shown by statement F 36, was..... 496,789

Total value of imports and exports to and from Sheboygan, which passed over St. Clair flats in reaching their destination, during the year 1855..... 5,656,387

That is to say, five million six hundred and fifty-six thousand three hundred and eighty-seven dollars.

Should the cessions of jurisdiction and possession of the Sheboygan harbor piers be accepted by the United States, it will become necessary, for the completion of the harbor, to extend these piers to a depth of fifteen feet water outside of the present bar at the harbor entrance. This is the depth recommended by my predecessor, Captain J. D. Webster, of the corps of topographical engineers, and I agree with him; because, short of this depth, a littoral current, sufficiently strong to waft the silt held in suspension clear of the harbor entrance, will not be met.

Captain Webster indicates seven hundred feet of additional pier work as necessary, for both piers, to reach that depth.

No accurate map of the harbor of sufficient extent was then, however, extant; (that is, of a period sufficiently recent to be fully reliable now;) and I regret that I have not yet been able to accomplish a minute survey of this harbor since I have been in charge. The limited assistance at my command prevented it. The first field duty assigned for the month of May ensuing contemplates, however, a full and accurate survey of this harbor.

But I will remark, that a close reconnaissance of the harbor and bar, made by myself in April, and again in June, 1854, indicated the length of pier work, for both piers, necessary to extend the present piers out to a depth of fifteen feet, was 672 feet; requiring the addition, for both piers, of 21 cribs, each 32 feet long by 20 feet wide; and requiring an average height, from bottom to top, of 20 feet.

To obtain a depth of twelve feet of water over the bar, and between the piers, will require dredging to the amount of 12,617 cubic yards of sand and clay.

I herewith present an estimate, marked F 31, of the cost of constructing these twenty-one cribs, of the above amount of dredging, of repairing the present piers should they be accepted by the United States, and of procuring a full set of meteorological instruments for observations here, similar to those recommended for Milwaukee and other harbors. This estimate amounts (after deducting the balance of the former appropriation for this harbor, now remaining unexpended,*) to the sum of \$36,614 55.

*This unexpended balance amounts to \$6,700.

The width of the channel-way between the piers is now only 175 feet. This is not a sufficient width for the accommodation of shipping lying along side of the piers to receive or discharge freight where the warehouses are situated, and for a free passage up and down the channel besides.

Moreover, vessels aiming to enter so narrow a harbor, under a strong northerly wind, or gale, if bound in from the northward, are often unable to luff quick enough to do so, with so little sea room. They are frequently, therefore, carried to leeward, past the harbor entrance entirely. I would recommend, in the extension of the piers of this harbor, that a width between the piers of at least two hundred and forty (240) feet should be at once assumed by obliquing the three first cribs of the south pier, so as to gain the increased width of sixty-five feet. Then to resume the parallelism with the north pier on its present course. The river for some distance above the piers is full three hundred (300) feet wide, and its downward current would, I am sure, afford the necessary scour for the channel-way with this increased width between the piers. Unless this be done, I believe it will be much regretted by the commercial community in future years.

The statistics of the trade of Sheboygan show that this port has already attained a high rank among the growing commercial ports of Lake Michigan. She already supplies an extensive back country with the requisite articles of importation for consumption, and receives in return a large amount of agricultural products for exportation. One or two railroads are in contemplation from Sheboygan to traverse the rich country to the west, and she has a very fair prospect of increasing her commercial importance so as to require a good harbor, easy of ingress and egress for the largest class of lake vessels. It is also contemplated to extend the Lake Shore Railroad (which now runs between Chicago and Milwaukee) to connect Milwaukee with Sheboygan, a distance of about fifty miles. This connexion will probably be made before the end of the year 1856.

F 1.

Colonel Graham to Colonel Abert.

[Extract.]

[No. 2.]

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
Chicago, May 1, 1854.

"SIR: I returned to this place yesterday, after having made an inspection of the works of harbor improvements of Milwaukee and Sheboygan."

* * * * *

"The piers erected at Sheboygan last year, by the civil authority, at the expense of the city and county, were very much injured during the last winter, in consequence of the slight manner in which the

work was executed. The ties connecting the outer and inner walls of each pier have, to a very great degree, been dislocated. The civil authorities, understanding there would be objections to the amalgamating public with private work, have now under consideration an act ceding to the United States this site, and the work so far as it has progressed, in the hope that this will remove all impediment to the expenditure of a part of the public appropriations to repair the work as it now stands.

"I would earnestly recommend this course as the best means of rendering the improvements effective in case this act should be passed, of which I will give you due information.

"I am, very respectfully, your obedient servant,

"J. D. GRAHAM,

"*Bvt. Lieut. Col., Superintending Engineer, &c., &c.*

"Col. J. J. ABERT,

"*Chief Topographical Engineers, Washington.*"

P. S.—I beg leave to remark that there are now materials enough on hand to enable us to go on with the works at Waukegan, Sheboygan, and Michigan city, so soon as the plans shall be disposed of by the Board of Engineers.

J. D. G.

F 2.

Agent Newland to Colonel Graham.

OFFICE OF PUBLIC WORKS,
Sheboygan, May 1, 1854.

SIR: Please find enclosed the relinquishment on the part of the city and county of Sheboygan, in accordance with your suggestions, and with the entire approval of all I have conversed with upon the subject.

The property, of course, is now belonging to the federal government, and it will be the imperious duty of the general government to take care of it.

The condition of the harbor, caused by the late northeast winds, during your detention here, has rendered the improvement much more damage than when you examined it on the 27th ultimo, and the bar at the mouth has increased one foot.

In my judgment, something should be done immediately to protect the piers; if not, they will doubtless be lost. We can, however, do nothing without suitable craft to work with, viz: a scow, dredge and yawl; as to other materials, they can be readily purchased here on terms quite reasonable. I cannot have a good scow built here short of one hundred and sixty dollars; yawl, sixty dollars. We want a government dredge, provided one can be spared, at the earliest convenience, at this point, if it can be done without material injury to government.

Captain Webster received a dredge built by government and put in his charge in September or October last.

In relation to the amount of materials on hand, please see Colonel Abert's reports, page eighteen. As to the materials of Hawley, Sweet and Ives, see certificate of measurement in their possession.

If you desire a copy of the measurement, please inform me, and it shall be forwarded forthwith.

Very respectfully, your obedient servant,

D. NEWLAND,
United States Agent.

Col. J. D. GRAHAM,
Superintending Engineer, &c., &c., Chicago Illinois.

P. S.—This was prepared on the 1st instant, at which time I was promised what I have stated was enclosed; but owing to some scruples as to the power necessary to make a legal relinquishment, I waited until now. I am now promised the relinquishment, and without doubt it will be made on Friday next, at which time I will forward it.* The city council will hold their meeting at that time. This you will please accept as my apology for not attending to it before.

D. N.

F 3.

Colonel Graham to Agent D. Newland.

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
Chicago, May 15, 1854.

SIR: I have received your letter of the 1st instant. In reply, I have to remark that it was not my desire or intention to urge the citizens of Sheboygan to make a transfer of the piers and the ground they occupy to the United States, if contrary to their inclination to do so. I only suggested to a few, who seemed interested in the harbor improvement, that such a step, if entirely in accordance with their views, seemed to me desirable, as a necessary preliminary to the expenditure of public money, appropriated by Congress, in repairing and perfecting the present work.

You have, no doubt, seen accounts of the proceedings of the common council of Milwaukee in regard to a similar matter there. These proceedings will enable me to push forward the work for their harbor improvement immediately.

I am, very respectfully, your obedient servant,

JAMES D. GRAHAM,
Lieut. Col., Sup. Eng. Lake Michigan Works.

D. NEWLAND, Esq.,
United States Agent, Sheboygan, Wisconsin.

*It was afterwards forwarded to me with Agent Newland's letter of May 26, 1854, and is hereto attached, marked F 5.

J. D. G.

F 4.

Agent Newland to Colonel Graham.

OFFICE OF PUBLIC WORKS,
Sheboygan, Wisconsin, May 26, 1854.

SIR: Please find enclosed a certified copy of an ordinance of the common council of this city, which needs no explanation from me. As a matter of course, the harbor is now the property of the federal government. I therefore deem it my imperative duty to urge the immediate repairs necessary for its protection, which, in my judgment, will require the expenditure of five thousand dollars. I beg leave to suggest that the materials necessary for the above repairs, in my opinion, can be purchased in open market more advantageously than by receiving proposals for contract, as there are persons in this vicinity who would be willing to enter into small contracts for the delivery of materials at rates greatly below the price which extensive contracts could be let at. You will, however, instruct me what course to pursue.

The harbor has been much damaged since you examined it. The present is a favorable season of the year to make the necessary improvements on the harbor, and to expend the remaining portion of the appropriation in the further extension of the harbor. I therefore require the above sum of five thousand dollars, for the purpose above stated.

You will do me a great kindness by answering me at your earliest convenience.

I have the honor, very respectfully, to be your obedient servant,
D. NEWLAND,

United States Agent.

JAMES D. GRAHAM,
*Lieut. Col. Corps Topographical Engineers,
Superintending Engineer, &c., &c., Chicago, Illinois.*

F 5.

Resolution by the common council of Sheboygan, Wisconsin, to relinquish to the federal government the harbor of Sheboygan.

Resolved, by the mayor and common council of the city of Sheboygan, in the State of Wisconsin, That so far as the city of Sheboygan is interested in the harbor at this point, that all the interest in said harbor is hereby relinquished to the federal government of the United States of America, provided the federal government will take charge of the same immediately and keep it in repair.

Passed May 12, 1854.

A. H. BROOKS,
Acting Mayor.

STATE OF WISCONSIN,
City and county of Sheboygan, } ss.
Office of the city clerk.

I, Alfred Marschner, clerk of the city of Sheboygan, in the State of Wisconsin, hereby certify that the above is a true and correct copy of a resolution of the common council of said city, passed the 12th day of May, 1854.

[L. s.] In testimony whereof, I affix my official signature and seal of my office. Dated May 26, 1854.

ALFRED MARSCHNER,
City Clerk.

F 6.

From Custodian Agent D. Newland to Colonel Graham, Superintending Engineer.

OFFICE OF THE HARBOR AGENCY,
Sheboygan, Wisconsin, June 14, 1854.

SIR: I was taken sick on my return from Chicago, Illinois, when I visited you, and have been confined to my room ever since, and consequently had to make my return for May last through my friend C. P. Hiller, esq.; I am now convalescent, so much so, that I was enabled to make an examination of the harbor this day, and was surprised to find the material damage done to it by the late northeastern gale, on the 4th and 5th instant.

It is self-evident, that unless the improvements already made be speedily protected, they will be almost a total wreck. This, in my judgment, could be prevented by the application of the trivial sum of three thousand dollars, which I urgently solicit may be immediately applied.

You found, in my report made by Mr. Hiller, a second ordinance of the city council of this city, which I hope will be satisfactory. The board of county supervisors will meet in the course of a fortnight, and will doubtless make a similar relinquishment. The great solicitude felt by the citizens of this section of country for the application of the unexpended part of the appropriation, or at least the sum above named, during the present summer, is tendered again as an apology for urging the most early operations on the works.

I hope, sir, that you favorably consider my application for the government dredge and dredge scows.

I have the honor to be, very respectfully, your obedient servant,
D. NEWLAND,
United States Agent.

JAMES D. GRAHAM,
Lieut. Col. Corps Top. Engineers,
Superintending Engineer, &c., &c., Chicago, Illinois.

F 7.

Resolution by the common council of the city of Sheboygan.

Resolved, by the mayor and common council of the city of Sheboygan, That so far as the city of Sheboygan is interested in the harbor at this point, that all the interest in said harbor is hereby relinquished to the federal government of the United States of America, provided the federal government will take charge of the same immediately.

Passed June 10, 1854.

J. F. KIRKLAND, *Mayor.*

STATE OF WISCONSIN,
City and county of Sheboygan, } ss.

I, Alfred Marschner, clerk of the city of Sheboygan, in the State of Wisconsin, do hereby certify that the above is a true copy of a resolution passed by the mayor and common council of said city on the 10th day of June, 1854.

[L. s.] In testimony whereof, I subscribe my official name and affix the seal of my office, June 12, 1854.

ALFRED MARSCHNER,
City Clerk.

F 8.

Colonel Abert to Colonel Graham.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, June 19, 1854.

SIR: I send you the enclosed papers* from Agent Newland at Sheboygan, with a report from this office, and the direction of the War Department.

You will repair to Sheboygan, inspect and report, returning the papers now sent to this office.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps of Topographical Engineers.

Lieut. Col. J. D. GRAHAM,

Corps Topographical Engineers, Chicago, Illinois.

*These papers were returned to the Topographical Bureau, and are not, therefore, inserted here. J. D. G.

F 9.

Colonel Abert to the Secretary of War.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, June 2, 1854.

SIR: In reference to the letter from D. Newland, esq., agent at Sheboygan, I have the honor to report that the plan of the board for the improvement of this harbor was submitted to the War Department on the 21st of April.

Mr. Newland speaks more particularly of repairs to harbor works erected by the city authorities. Having no accurate account of these, it is not in my power to say what repairs are required. But the bureau understands that the work referred to is not a year old, and unless it be bad work it should not now require repairing.

It is respectfully suggested that the papers be sent to Lieutenant Colonel Graham, with directions to inspect and report.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Col. Corps Top. Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

F 10.

Colonel Graham to Agent Newland, of Sheboygan, Wisconsin.

OFFICE GENERAL SUPERINTENDENCE
 OF LAKE MICHIGAN WORKS,
Chicago, June 23, 1854.

SIR: Your communications of the 14th and 20th instant were duly received.

I regret exceedingly to learn that so great a damage was done to the harbor of Sheboygan by the severe gale of the 4th and 5th instant. It was what I apprehended would take place when I inspected that work last month, owing to the imperfect manner in which the piers were constructed.

In your letter you say: "It is self-evident, that unless the improvements already made be speedily protected, they will be almost a total wreck. This, in my judgment, could be prevented by the application of the trivial sum of \$3,000, which I urgently solicit may be immediately applied."

In reply to the above, I have to remark, that the impediment to the repairs, by the United States, of the Sheboygan piers lies alone in the law which prohibits the expenditure of public money upon a private

work. I have, as I have always heretofore explained to you, been waiting most anxiously the joint action of the city and county authorities of Sheboygan, conveying to the United States this work and the site it occupies, so as to enable me to present the subject to the consideration of the department at Washington in a manner that would entitle it to favorable notice. So far as the present moment those authorities have done nothing towards advancing the necessary preliminaries. The account given of the state of the work shows the importance of an early action, which must be *conjoint* between the *city* and *county*, as I understand they are joint proprietors.

The resolution of the common council of the city, passed on the 12th ultimo, relinquishes to the United States all the interest of the said city in the harbor, "*Provided*, The federal government will take charge of the same immediately and keep it in repair." This *proviso*, as I explained to you on the occasion of your late visit to this place, involves a condition which the general government could not undertake to stipulate for, because the Executive could not control Congress in reference to the appropriations for such works. It was for this reason that I did not consider it proper to submit the proposition to the Bureau of Topographical Engineers, at Washington. I advised a course similar to that pursued by the city council of Milwaukee, which cedes to the United States the land or site occupied (or proposed to be occupied) for the harbor improvement, without binding the United States to any obligation whatever in regard to constructing or keeping in repair the said harbor improvement; but declares that the conveyance is made for that purpose and for no other. This, you will perceive, reserves for the city a reversionary right in the said land or site, in case the United States government should not use or occupy it for the specific purpose mentioned.

In the second resolution of the city council of Sheboygan, passed the 10th of the present month, there is still a condition which I think it would be better to avoid, because the general government cannot be bound in a matter which rests upon the will of Congress, from time to time, as a matter of expediency. Moreover, there must be a conjoint or concurrent action, on the part of the city and county, in this matter, as they are *joint proprietors*, if I am correctly informed, in the work as it now exists. I therefore respectfully suggest to those authorities that they should both adopt, with as little delay as possible, the course pointed out in the accompanying paper, marked (F 11,) which, while it avoids the objections pointed out above, reserves to the city and county of Sheboygan a reversionary right to enter upon and keep in repair the said work, in case the government of the United States should at any time fail to do so—a contingency which would not be likely to arise unless Congress should at any time fail to appropriate money for that object, and this is one which the Executive could not control. If this be adopted, I have no reason to doubt that authority would be given to take possession of the piers at Sheboygan, and put them in repair out of the balance remaining of the last appropriation made by Congress for the improvement of that harbor.

I request that you will communicate to this office the earliest in-

formation of any action that may take place by the authorities of the city and county on this subject, in order to my early communication to Washington respecting it.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Superintending Engineer.

D. NEWLAND, Esq.,

U. S. Agent, Sheboygan, Wis.

F 11.

Form for a deed of conveyance, suggested by Colonel Graham.

Whereas it is the interest of the city and county of Sheboygan, in the State of Wisconsin, and the desire of the authorities of said city and of the said county, that a portion of the appropriation granted, or which may hereafter be granted by the Congress of the United States of America, for the improvement of the harbor of Sheboygan, in the State of Wisconsin, should be laid out and expended in repairing and preserving or in improving the piers now existing at the harbor of the aforesaid city of Sheboygan, which were erected at the expense and cost of the aforesaid city and county :

And whereas it is not lawful for the officers or agents of the United States to lay out or expend money thus appropriated by Congress upon any work not belonging to or previously ceded to the United States, or upon any work or structure standing or resting upon ground not belonging to or previously ceded to the United States: Therefore be it, and it is hereby,

Resolved, by the mayor and common council of the city of Sheboygan, in the State of Wisconsin, and also by the board of supervisors of the county of Sheboygan, in the aforesaid State, That, for the purpose of enabling the United States, through its proper officers, engineers, and agents, or either of them, to repair, preserve, or improve, and to keep in repair or improvement the aforesaid piers and the harbor of Sheboygan, for the benefits of commerce and for the public welfare, all the right, title, and interest of the aforesaid city and of the aforesaid county of Sheboygan, in the State of Wisconsin, in and concerning the aforesaid piers, and the ground or site which the same rest upon or occupy, are hereby conveyed and ceded to the United States of America, for the purpose aforesaid, and for no other: *Provided, however*, That in case the United States should fail to keep in repair the aforesaid piers from the want of appropriations by Congress, or from any other cause, the aforesaid city and county of Sheboygan reserve to themselves the right, through their proper officers, engineers, or agents, to enter upon the said work for the purpose of making and to make the repairs of the same which may be necessary for its preservation and for the benefits of commerce.

F 12.

Colonel Graham to the Mayor and Common Council of the city of Sheboygan, Wisconsin, and to the Board of Supervisors of the county of Sheboygan.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, Illinois, June 23, 1854.

GENTLEMEN: It is very important that no time should be lost in commencing the repairs and improvements of the piers for the preservation of the harbor of Sheboygan. I have, ever since my inspection of that harbor in April last, been anxiously awaiting such joint or concurrent action of the authorities of your city and county in reference to these piers, and the ground or site they occupy, as will enable the United States government to lay out and expend, for that purpose, a portion of the unexpended balance of the appropriation made by Congress for the improvement of Sheboygan harbor. You are aware, no doubt, that it is not lawful for any United States officer or agent to expend money appropriated by Congress for such an object, upon any private work, or upon any work, until it, and the site it occupies, shall have been previously conveyed to the United States. In this case, the conveyance and relinquishment must be conjoint or concurrent by the city and the county authorities.

With a view to effecting this in proper form, provided it be the desire of your bodies that it be done, I beg leave to refer you to a communication I have addressed this day to D. Newland, esq., United States agent at Sheboygan, with a draft for the form of conveyance, and instructions in the case.

I am, very respectfully, gentlemen, your obedient servant,

J. D. GRAHAM,

Lt. Col., Sup. Eng. of Lake Michigan Works.

The MAYOR AND COMMON COUNCIL

*of the city of Sheboygan, and the Board of Supervisors
of the county of Sheboygan, State of Wisconsin.*

F 13.

Colonel Graham to Colonel Abert.

[Extract.]

[No. 32.]

" OFFICE GENERAL SUPERINTENDENCE

" OF LAKE MICHIGAN WORKS,

" *Chicago, August 19, 1854.*

" SIR :

* * * * *

"2. In compliance with your orders of the 19th of June, I repaired to Sheboygan and inspected the piers there. I did not find them in a

much worse condition than was reported in my letter to the bureau, (No. 2,) on the 1st of May last.

"Like most contract work, as far as my observation has extended, these piers are not so well built as the government piers generally are upon this lake, and, consequently, they have not withstood so well the shocks of the late storms.

"For the want of sheath piling on the exposed faces of the terminating cribs of the two piers, they have both dipped to the northeast, from being undermined by the lake current. This has twisted and ruptured some of the timbers, but the necessary repairs can conveniently be made, as the damage is chiefly above the water surface.

"Under your instructions of the 26th of June, a survey of this harbor has been commenced. So soon as it shall be satisfactorily completed, a map will be made out and forwarded to the bureau.

* * * * *

"I have the honor to be, very respectfully, your obedient servant,
J. D. GRAHAM,

"Lieut. Col., Superintending Engineer, &c., &c."

"Colonel J. J. ABERT,

"Chief Topographical Engineers, Washington."

F 14.

Colonel Graham to Colonel Abert.

[No. 37.]

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, September 9, 1854.

SIR: The enclosed letter from Agent Newland to the War Department, of May 26th last, together with the copy of the resolutions of the common council of Sheboygan, of May 12th, which accompanied it, should have been returned to the Topographical Bureau with my report of the 19th ultimo.

I will remark that Agent Newland, at the same time, forwarded to me a copy of the same resolutions, and without knowing that he had addressed the War Department on the subject, I immediately informed him that the resolutions were insufficient or inadmissible, because the *proviso* attached would stand in the light of a contract binding the government. Moreover, that the relinquishment to the United States of the piers and the site they occupy required the joint or concurrent action of the county authorities of Sheboygan, as well as that of the city authorities, because the county and city were joint proprietors in the property.

Whereupon, the separate but concurrent relinquishments were adopted by the county and city, which are set forth in the copies

herewith sent, marked A and B.—(Marked F 15 and F 16 in this series.)

I have the honor to be, very respectfully, your obedient servant,

J. D. GRAHAM,

Bv't Lieut. Col., Superintending Engineer, &c.

Col. J. J. ABERT,

Chief Topographical Engineers.

F 15.

Deed of conveyance from the county of Sheboygan, Wisconsin, to the United States, of all its right, title and interest in the harbor piers at the port of Sheboygan, to enable the said United States to repair and improve the same for the benefit of commerce.

Whereas it is the interest of the city and county of Sheboygan, in the State of Wisconsin, and the desire of the authorities of the said city and of the said county, that a portion of the appropriation granted, or which may hereafter be granted by the Congress of the United States of America, for the improvement of the harbor of Sheboygan, in the State of Wisconsin, should be laid out and expended in repairing and preserving, or in improving, the piers now existing at the harbor of the aforesaid city of Sheboygan, which were erected at the expense and cost of the aforesaid city and county :

And whereas it is not lawful for the officers or agents of the United States to lay out or expend money thus appropriated by Congress upon any work not belonging to or previously ceded to the United States, or upon any work or structure standing or resting upon ground not belonging to or previously ceded to the United States :

Therefore be it, and it is hereby, *Resolved*, by the board of supervisors of the county of Sheboygan and the State of Wisconsin, That, for the purpose of enabling the United States, through its proper officers, engineers, and agents, or either of them, to repair, preserve, or improve, and to keep in repair or improvement the aforesaid piers and the harbor of Sheboygan, for the benefit of commerce and for the public welfare, all the rights, title, and interest of the aforesaid county of Sheboygan, in the State of Wisconsin, in and concerning the aforesaid piers, and the ground or site which the same rest upon or occupy, are hereby conveyed and ceded to the United States of America for the purposes aforesaid, and for no other : *Provided, however*, That in case the United States should fail to keep in repair the aforesaid piers from the want of appropriations by Congress, or from any other cause, the aforesaid city and county of Sheboygan reserve to themselves the right, through their proper officers, engineers, or agents, to enter upon said work for the purpose of making, and to make, the repairs of the same, which may be necessary for its preservation and for the benefits of commerce.

STATE OF WISCONSIN, }
Sheboygan county, } ss.

I, James T. Kingsbury, clerk of the board of supervisors of said county, do hereby certify that the above and foregoing preamble and resolution is a true copy of the original preamble and resolution passed by the county board of supervisors of said county, July 18, 1854.

Witness my hand and seal of office at Sheboygan, this 20th day of July, A. D. 1854.

JAMES T. KINGSBURY,
[L. s.] Clerk of Board of Supervisors, Sheboygan county, Wisconsin.

F 16.

Deed of conveyance from the city of Sheboygan, Wisconsin, to the United States, of all its right, title, and interest in the harbor piers at the said city, to enable the said United States to repair and improve the same for the benefit of commerce.

Whereas it is the interest of the city and county of Sheboygan, in the State of Wisconsin, and the desire of the authorities of the said city and of the said county, that a portion of the appropriation granted, or which may hereafter be granted by the Congress of the United States of America, for the improvement of the harbor of Sheboygan, in the State of Wisconsin, should be laid out and expended in repairing and preserving, or improving, the piers now existing as the harbor of the aforesaid city of Sheboygan, which were erected at the expense and cost of the aforesaid city and county:

And whereas it is not lawful for the officers or agents of the United States to lay out or expend money thus appropriated by Congress upon any work not belonging to or previously ceded to the United States, or upon any work or structure standing or resting upon ground not belonging to or previously ceded to the United States: Therefore be it, and it is hereby,

Resolved, by the mayor and the aldermen of the city of Sheboygan, in the State of Wisconsin, That for the purpose of enabling the United States, through its proper officers, engineers and agents, or either of them, to repair, preserve, or improve, and to keep in repair or improve the aforesaid piers, and the harbor of Sheboygan, for the benefit of commerce and for the public welfare, all the right, title, and interest of the aforesaid city of Sheboygan, in the State of Wisconsin, in and concerning the aforesaid piers, and the ground or site which the same rest upon or occupy, are hereby conveyed and ceded to the United States of America, for the purposes aforesaid, and for no others: Provided, however, That in case the United States should fail to keep in repair the aforesaid piers from the want of appropriations by Congress, or from any other cause, the aforesaid city and county of Sheboygan reserve to themselves the right, through their proper officers, engineers, and agents, to enter upon said work for the purpose of

making and to make the repairs of the same which may be necessary for its preservation and for the benefits of commerce.

Dated Sheboygan, July 25, A. D. 1854.

J. F. KIRKLAND, *Mayor*.

ALFRED MARSCHNER, *City Clerk*.

I, Alfred Marschner, clerk of the city of Sheboygan, in the State of Wisconsin, do hereby certify that the within is a true and correct copy of a resolution passed by the mayor and common council of said city of Sheboygan, on the 25th day of July, 1854.

In testimony whereof, I have hereunto set my hand and affixed [L. s.] the seal of the city of Sheboygan, this 29th day of July, A. D. 1854.

ALFRED MARSCHNER, *City Clerk*.

F 17.

Colonel Abert to Colonel Graham, with the directions of the War Department.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, September 14, 1854.

SIR: Your letter of the 9th instant, enclosing further cessions in reference to the piers at Sheboygan, has been recieved.*

On the 26th June the approved plan in reference to the work at this place was sent to you, and an apprehension that the entire endorsement of the honorable Secretary upon that plan was not sent with it, it is sent herewith.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Eng'rs.

Major J. D. GRAHAM,
Corps Top. Engs., Bvt. Lieut. Col., &c.,
Chicago, Illinois.

Endorsement of the Secretary of War.

The plan recommended is approved, so far as the same can be carried into effect with the funds at the disposal of the department.

If the agent of another work be temporarily employed on this work, he must, while so employed, be paid from the appropriation for it.

The department has no authority to accept the cession of jurisdiction over the piers erected by the town or other corporate authorities.

JEFF'N DAVIS,
Secretary of War.

WAR DEPARTMENT, *June 23, 1854.*

* See F 14, 15, and 16 preceding.

F 18.

Colonel Graham to Colonel Abert.

[No. 50.]

OFFICE OF GENERAL SUPERINTENDENCE, &c.,
Chicago, September 26, 1854.

SIR: I have the honor to acknowledge the receipt of your letters of the 14th and 18th instant.

In reply to that of the 18th, I have to state, that I supposed that the reference I made to your letter of the 26th of June, in my report of August 19th ultimo, (No. 32,) would be a sufficient answer to it.

I may have misconstrued the purport of the endorsement of the honorable the Secretary of War upon that letter, at the time it was received. As your letter of the 19th of June instructed me to repair to Sheboygan, to inspect and report upon the condition of the piers there, upon the representation of Agent Newland of the dilapidated condition they were in from the effect of recent storms, I supposed it was with the view of having them repaired at the expense of the United States. I had been informed by Agent Newland that the department had decided that this could not be done as long as they remained the property of the town and county; and I thus inferred that the impediment lay in the feature in the first deed of cession, which bound the government always to keep them in repair. It was to remove this feature that those authorities adopted the subsequent act of cession.

I now understand that the work cannot be accepted by the government under either of these acts. The report of the Board of Engineers (as I have understood it, at least,) does not authorize either the repair or extension of these piers while they remain the property of the city and county of Sheboygan. In the third page of that report is the following, viz: "In reference to such an extension, the superintending engineer* holds the following language:

" 'I see no way of carrying on the work, except, as intimated, of adding to the piers already existing. But I submit that it will be proper for the county and town authorities to cede all their right and jurisdiction over the present work to the United States.' In this opinion the Board of Engineers concurs." Conceiving that I stand instructed by the above, as a condition, as much as by any other part of the plan of the board, I have not, up to this time, felt authorized to expend any public money on this harbor, except in making the survey required.

If I have not met your views in this I shall regret it, and I beg leave respectfully to ask specific instructions upon this point.

A copy of the papers which were communicated with your letter of the 26th of June, with the decision of the War Department thereon, has been forwarded to Agent Newland, (now custodian,) to be filed in his office at Sheboygan.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Bvt. Lieut. Col., Superintending Eng'r, &c.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

* Captain J. D. Webster, Topographical Engineers.

F 19.

Colonel Graham to Agent Newland.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, September 26, 1854.

SIR: By direction of the Topographical Bureau of the War Department, I enclose to you herewith a copy of the report of the Board of Engineers in relation to Sheboygan harbor; also a copy of the letter of Colonel Abert, chief topographical engineer, of April 21, 1854, to the Secretary of War, with a copy of the honorable the Secretary's decision endorsed thereon, in reference to the proposed cession of the Sheboygan harbor piers to the United States. The bureau directs that these papers be filed in your office.

You will observe by the report of the Board of Engineers that the plan for the extension of the piers will not be presented until the survey you were directed to make is completed. I have been anxiously waiting the result of your survey, laying down accurately the position of the light-house, in order to complete the map here and forward it to Washington. I do not see why the course of the wind should obstruct this work. All that is requisite is to go to the end of the pier and take the compass bearing from thence to the centre of the light-house. Then measure with a surveyor's chain accurately the distance from the crib of that pier to any convenient point on the shore from whence to depart, and run one or more lines to the light-house. The compass courses of all these lines, beginning at the end of the pier, and ending with the last course, must be reported to me in connexion with the distances on each course, thus: Station No. 1, at end of pier.

	Course.	Distances.	Remarks.
From station 1 to 2			
Do...do...2 to 3			
Do...do...3 to 4			
Do...do...4 to 5			
Do...do...5 to 6			

It will not answer to make these measurements with anything but a surveyor's chain. A cord will not be correct enough. If you record the distances in chains and links, the length of the chain and the length of each link must be mentioned. Your early despatch of this is very important.

As the department cannot accept the jurisdiction ceded by the city and county of Sheboygan over the present piers, the appropriation cannot, I presume, be applied in any other way than the building by government of an extension of those piers, the said extension to be the property of the government.

I beg to call your early compliance with the circular which requires

all agents and custodians to make returns to this office, at the end of each quarter, of all public property in their charge.

They will be due on the 30th instant.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Superintending Engineer, &c., &c.

D. NEWLAND, Esq.,

U. S. Custodian Agent, Sheboygan, Wisconsin.

F 20.

Colonel Abert to Colonel Graham.

[Copy to be filed in Agent Newland's office, Sheboygan, Wisconsin.]

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, June 26, 1854.

SIR: I transmit, for your information and government, copies of papers in reference to the harbor of Sheboygan. The papers consist of the plan of the board, of a report from this office of April 21, 1854, and of the directions of the Secretary, dated June 23, 1854.

I think these papers should be filed in the office at Sheboygan.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Lieut. Colonel J. D. GRAHAM,

Corps Topographical Engineers, Chicago, Illinois.

F 21.

Colonel Abert to Colonel Graham.

[Copy to be filed in Agent Newland's office, Sheboygan, Wisconsin.]

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, April 21, 1854.

SIR: I have the honor to submit the report of the Board of Engineers on lake harbors and western rivers, in reference to the harbor of Sheboygan.

The views of Captain Webster, which are approved by the board, involve an expenditure (in addition to present means) of about \$22,000. The amount of the United States appropriation for 1852 was \$10,000, of which there is now available \$9,195.

The original survey, plan, and estimate for the work was by J. M. Berrian, esq., in 1838. The total estimate was for \$84,900.

The expenditure of \$30,000, to which the board refers, is from local sources.

The board recommends an accurate survey, to exhibit present condition of localities. This could be attended to by Lieutenant Colonel Graham, if allowed to use Gamble, agent at Waukegan, as assistant;

Gamble, in the mean time, to draw his pay from the Waukegan fund. The survey then would cost about \$1,000; but if Gamble were paid out of the Sheboygan fund, it would then cost (to that fund) about \$1,500. Gamble is very competent to do the work under the direction of Lieutenant Colonel Graham.

This idea of a survey also involves the consideration that the present report of the board (about Sheboygan) is a preliminary report in reference to that harbor, liable to revision when the proposed survey is made.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,

Secretary of War.

—
Endorsement.

The plan recommended is approved, so far as the same can be carried into effect with the funds at the disposal of the department.

If the agent for another work be temporarily employed on this work, he must, while so employed, be paid from the appropriation for it.

The department has no authority to accept the cession of jurisdiction over the piers erected by the town or other corporate authorities.

JEFF'N DAVIS, *Secretary of War.*

WAR DEPARTMENT, *June 23, 1854.*

—
F 22.

Report of the Board of Engineers on the improvement of Sheboygan harbor, Wisconsin.

OFFICE BOARD OF ENGINEERS,

LAKE HARBORS AND WESTERN RIVERS,

Washington, April 17, 1854.

SIR: The subject of the improvement of the harbor of Sheboygan having been laid by the bureau before the board, I am instructed by the board to make the following report thereon:

The present harbor was constructed under authority of the State of Wisconsin by the harbor commissioners of the town and county of Sheboygan, and consists of two parallel piers of 1,000 feet, 175 feet apart. These piers are formed of pile docking for 400 feet to the line of the lake shore, and thence by crib work for 600 feet to 10½ feet water into the lake, at the present stage. The cost of these works, including dredging to 12 feet water, it is understood has been \$30,000.

In the memoranda that accompany the annual estimate from this office, dated November last, the considerations which influence the board in recommending the sum of \$11,000 for the fiscal year ending the 30th of June, 1855, for this work, are in these words:

“The superintending engineer, Captain J. D. Webster, topographical engineers, in his annual report of September 1, says of this harbor: ‘The work cannot be considered complete without the addition of 700 feet to the piers put down by the county and town authorities.’ ”

The cost of this extension he estimates at.....	\$26,936 00
He also provides for strengthening the present piers...	3,064 00

Amount.....	30,000 00
From which he deducts (supposed) available of lake appropriation.....	8,000 00

Leaving to be provided.....	22,000 00
-----------------------------	-----------

which, for some, at least, of the considerations which have governed in other cases, the board recommends may be divided into two seasons, by an appropriation of the amount asked for in the margin, namely, \$11,000.

The superintending engineer states in the same report that “this extension would be in an average depth of fifteen feet;” and although this depth exceeds the depth, to wit, twelve feet, deemed by the board the least to which all similar works on the lakes, to be efficient, should extend, yet, in view of the discrepancies that exist between the report and maps before the board, it did not hesitate to adopt the recommendation in question, believing the extension named would fall short of the length ultimately required. These discrepancies, which it was found impossible to reconcile, are as follows:

The agent says, “the further extension of the piers 240 feet will extend the works into twelve feet water;” whereas, taking his own map as authority, it will require 1,012 feet to reach that depth, and taking that of Lieutenants Center and Rose of 1836, but 175 feet. Again: the superintending engineer gives 700 feet for the extension of the piers, or 350 feet for each, bringing them into fifteen feet; whereas the map first mentioned indicates that it would require 1,125 feet, and the second map 375 feet, to reach that depth.

The position and direction of the present piers nearly conform with those drawn on the survey of Lieutenants Center and Rose, dated in 1836. The only important difference is, that the latter calls for a channel-way between the piers, into the river, of 200 feet; whereas the former is only 175 feet wide. The plans, with this single exception, indeed, are identical. Any extensions of the present piers may, therefore, be regarded as an extension of the original design, considered as unfinished, and that whenever they reach the proper depth the design is completed. In reference to such an extension, the superintending engineer holds the following language: “I see no way of carrying on the work except, as intimated, of adding to the piers already existing. But I submit that it will be proper for the county and town authorities to cede all their rights and jurisdiction over the present work to the United States.” In this opinion the board fully concurs. It is also of opinion that this extension should, as suggested by Captain Webster, be twenty feet wide; the cribs having open bottoms instead of close ones, as called for by the contract under which the

present works were constructed ; and that the jog in the alignment of piers, caused by this increased width, be on the outside, leaving the interior lines flush. The board would remark that the jog on the outside may be avoided, indeed, by putting the desired increased width of five feet, by an oblique line, all in the first crib.

It is likewise recommended that the entire work have a uniform height above the level of the lake by raising the 400 feet of each pier at the shore end, where, from the lesser depths, the surf necessarily rises highest.

In reference to the relative lengths of the two piers, the superintending engineer says: "I think we are not yet in possession of data on which to decide how to apportion the additional 700 feet between the two piers. It does not seem quite certain which of the two can be said to be the windward pier, or from which direction the main drift is to be expected. If there be any difference it will now soon appear, although it is certainly less marked than at most of the other ports on the lakes. However this may turn out, not less than the amount indicated, of pier work, will be necessary." The uncertainty on this point is confirmed by the notes of a member of the board in the examination of this harbor, which state that "the drift appears about equal north and south." On the other hand, the map furnished by the agent indicates, by the accumulation filling up the mouth of the original river north of the piers, and the corresponding dispersion of sand south of them, that the drift is from the north. Nevertheless, the board thinks the question of relative lengths of the piers should be left open, as dependent on the effects of the present piers through a longer period of time.

This experience will probably prove that the drift is from the north, and that, as a consequence, the north pier should be the longer of the two.

It will be seen from the foregoing remarks that the board approved of the course of operations recommended by the superintending engineer, Captain Webster. The cost of carrying them out received also the sanction of the board in its last annual estimates, and was only divided into two sums, from the impression that no larger amount would likely be obtained. As economical and engineering questions, however, the board does not hesitate to express the opinion that the entire amount should be available at one time.

The board, in conclusion, would respectfully recommend, in consideration of the discrepancies in the present maps, and between them and the reports to the bureau, already referred to, that a survey be made of the locality and surrounding waters out to the three-fathoms line of the lake.

The following papers are herewith returned : The annual report of Mr. D. Newland, agent, dated September 1, 1853. A, a sketch of the survey of the harbor, and a tracing of the mouth of Sheboygan river, from the survey by Lieutenants Center and Rose, dated in 1836.

I have the honor to be, sir, very respectfully, your obedient servant,

JAMES KEARNEY,

Lieut. Col., Top. Engineers, P't Board.

Colonel J. J. ABERT,

Chief Top. Engineers, Washington.

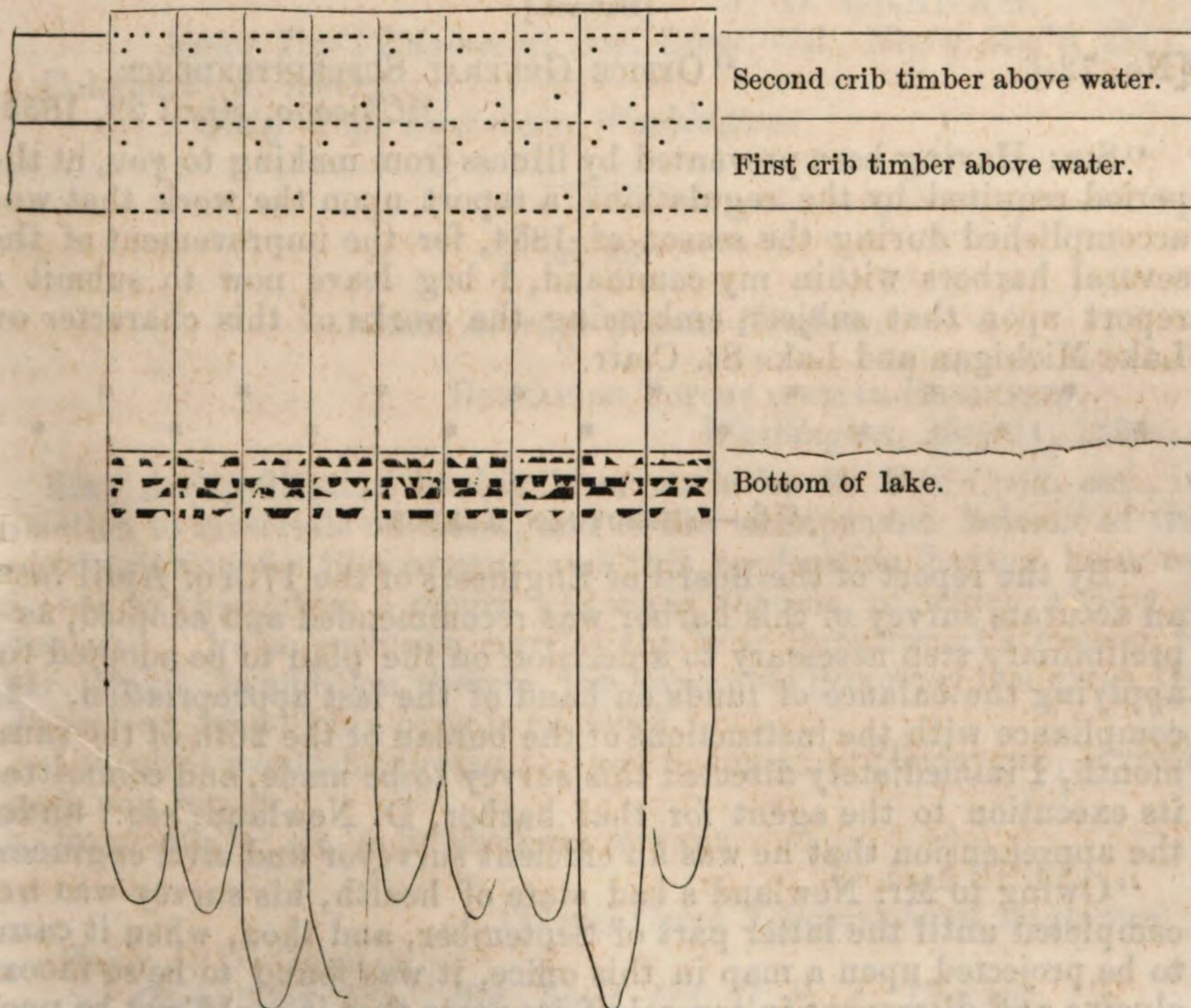
F 23.—*Colonel Graham's instructions to Agent Newland.*

OFFICE GENERAL SUPERINTENDENCE,
LAKE MICHIGAN WORKS,
Chicago, September 29, 1854.

SIR: Under my recommendation to the chief of topographical engineers, which has received the approval of the honorable the Secretary of War, you will protect the eastern ends, and the exposed faces of the most eastern crib of each pier at Sheboygan, by driving sheath-piles of oak plank, four inches thick, close together along those faces, so as to prevent the sand from being washed from under them by any future action of storms, or the usual lake current. These piles should be of a length to allow of their being driven 12 feet into the soil at the bottom of the lake, provided that before reaching that depth they are not resisted so much by the tenacity or hardness of the soil as to be split or broken by the force of the pile-hammer. When this effect is first perceived the driving should cease.

The best width for this sheath-piling is 8 to 10 inches. It should be of the toughest oak, least liable to split or sliver. Good white oak is, no doubt, the best kind for this purpose.

When the driving of the plank piles is finished, their upper ends should be cut off two feet above the level of the water surface, and each pile spiked to each of the two lower timbers of the pier-work (above water) by driving two spikes at the crossing of each pile with each crib-timber, or four spikes for each pile, thus:



Ends of the sheath-piles penetrating various distances into the soil.

These spikes should be of the best wrought-iron, 9 inches long, and $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square. Each spike will weigh .356 of a pound, or $35\frac{6}{10}$ lbs. per 100 spikes. You are authorized to purchase the sheath-piling and spikes, as I observe, by your return of property, that you have neither article on hand, and there would be too much time required to await bids under advertisements for proposals: *Provided, That the sheath-piling can be got for not exceeding \$18 50 per 1,000, board-measure, and the spikes not exceeding 8 cents per lb. These are liberal prices. The same kind of piles cost \$17 50 per 1,000 at Manitowoc harbor.*

I will immediately send you funds for carrying on this work.

Your full pay as agent will, under the rule of the War Department, be resumed on the actual commencement of this work, and continue while it lasts.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer, &c., &c.

D. NEWLAND, Esq.,

United States Custodian Agent, Sheboygan, Wisconsin,

F 24.

Colonel Graham to Colonel Abert.

[Extract.]

[No. 72.]

“OFFICE GENERAL SUPERINTENDENCE,

“*Chicago, April 29, 1855.*

“SIR: Having been prevented by illness from making to you, at the period required by the regulations, a report upon the work that was accomplished during the season of 1854, for the improvement of the several harbors within my command, I beg leave now to submit a report upon that subject, embracing the works of this character on Lake Michigan and Lake St. Clair.”

* * * * *

“6.—SHEBOYGAN HARBOR.

“By the report of the Board of Engineers of the 17th of April last, an accurate survey of this harbor was recommended and adopted, as a preliminary step necessary to a decision on the plan to be adopted for applying the balance of funds on hand of the last appropriation. In compliance with the instructions of the bureau of the 26th of the same month, I immediately directed this survey to be made, and committed its execution to the agent for that harbor, D. Newland, esq., under the apprehension that he was an efficient surveyor and civil engineer.

“Owing to Mr. Newland’s bad state of health, his survey was not completed until the latter part of September, and then, when it came to be projected upon a map in this office, it was found to be so inconclusive and discrepant in several of its parts that it could not be used

as authentic. I have been compelled, therefore, to reject it, and have given the necessary written instructions to a competent surveyor, who will proceed at once to make the required survey. So soon as the map can be projected from it, it will be forwarded to the bureau, with a report. In the meantime, proposals can be invited for the additional timber and iron necessary for completing as many cribs, in extension of the present piers on such course as shall hereafter be decided on, as the funds available for this work will enable us to construct.

"I have been officially informed that the city and county of Sheboygan propose to raise twenty thousand dollars, to be applied to the extension of the piers to a proper depth of water, under such plan as shall be adopted in building out as far as the available government funds will reach. Hence the additional importance of the accurate survey now about to be commenced.

"The outer cribs of the piers forming this harbor were levelled up to the proper height last autumn, but the agent did not succeed in obtaining the oak sheath-piling in time to have it driven along the exposed faces of these outer cribs. Should the city and county authorities succeed in raising the fund above alluded to, I would suggest that all necessary repairs and adjustment of the present piers should be made at the expense of that fund, and that the United States funds, now available, be applied to making the necessary survey and the construction of a distinct section of the work. I have sufficient funds in hand belonging to this harbor for present purposes."

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM.

Major Top'l Engineers, Bvt. Lieut. Col., Sup'g Eng'r, &c.

Colonel J. J. ABERT,

Chief Top. Engineers, Washington.

F 25.

Colonel Abert to Colonel Graham.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 14, 1855.

SIR: An application having been made by E. Fox Cook, esq., in relation to materials on hand, and to the unexpended balance of the appropriation for Sheboygan, and this application having been referred to this office, a report was made thereon, of which a copy is enclosed. I also enclose a copy of the War Department's answer to Mr. Cook. In addition thereto, the honorable Secretary has given the directions, of which a copy is enclosed.

I think it would be proper for you to repair to Sheboygan, investigate and report.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Major J. D. GRAHAM,

Corps Top. Eng., Bvt. Lieut. Col. U. S. A., Chicago, Ill.

F 26.

Colonel Abert to the Secretary of War.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 3, 1855.

SIR: I have the honor to submit the following report in relation to the letters of the 30th April and 2d May, and the papers sent with said letters from E. Fox Cook, esq., in relation to the harbor works at Sheboygan.

The propositions submitted amount to this: that the United States should abandon its appropriation (balance and materials on hand) to certain commissioners on the part of the town of Sheboygan, to be used, under their direction, for said harbor improvement. To my notions, there is no power to accomplish such a view; and even if the commissioners, or any one of them, were to be made the War Department agents for the work, the War Department plan would have to be respected, and the Treasury Department regulations in reference to accountability for materials and funds. I do not perceive how any agent or agents are to be relieved from this accountability without direction of law.

A case somewhat similar occurred in 1853, in relation to Milwaukee, in which the directions of the Department of War were as follows:

“In every case where money is furnished by a State, city, association, or individuals, in order that the same may be expended in the further prosecution of a work of harbor and river improvement to which Congress has given its sanction by a special appropriation, and it shall be requested by the authorities or persons having charge of such money that the office of engineers in charge of such work shall be allowed to continue the operations, in conformity with the plans and designs adopted by the War Department, to the extent the money so provided will permit, the officer of engineers or other agent of the general government may be instructed to comply with the request under the following conditions:

“1st. The officer or agent is to have no connexion with, nor responsibility for, the disbursement of the money so furnished, further than that he may give, from time to time, in compliance with any bargain or contract made under such provision of money, a statement of the amount of work done or materials supplied.

“2d. It must be perfectly understood by the authorities or persons supplying money in every such case, that the direction or supervision, by the government officer or agent, of the operations so carried on, is not to constitute nor to imply any claim, or shadow of claim, on Congress for reimbursement, nor is to be considered as pledging the general government to any support of that particular work or improvement beyond that already given by Congress.

“JEFF'N DAVIS,
“*Secretary of War.*”

These directions do not precisely cover the propositions submitted by Mr. Cook, but, as they establish a system involving the chief considerations of his propositions, it is respectfully recommended that they be made to apply to Sheboygan, and that parties be so informed.

The principal difference in the Milwaukie decision and the propositions of Mr. Cook are in the desire, on the part of the Sheboygan commissioners, to nominate the local engineer in charge of the work, and that said commissioners on the part of Sheboygan should have the control of the existing United States appropriation, materials, and balance of funds.

The decision of the department in the case to be communicated to Lieutenant Colonel Graham, with orders to repair to Sheboygan and to report.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

F 27.

The Secretary of War to E. Fox Cook, Esq., Mayor of Sheboygan, Wisconsin.

WAR DEPARTMENT, *Washington, May 9, 1855.*

SIR: I have received your letters of the 30th ultimo, with enclosure, and the 2d instant, proposing that the materials on hand and the unexpended balance of the appropriation for the improvement of Sheboygan harbor, Wisconsin, be transferred to the commissioners authorized by the legislature of Wisconsin to raise money to improve the harbor, &c., to be by them applied to the object.

In reply, I transmit you a report of the chief topographical engineer, expressing the views of the department on the subject, and pointing out the only manner in which there can be any connexion between the government and city of Sheboygan in their operations for the improvement of the harbor.

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

E. Fox Cook, Esq.,
Washington.

F 28.

Endorsement upon a letter from E. Fox Cook, Esq., by the Secretary of War, dated April 30, 1855.

“After expending the balance of the appropriation for the improvement of the harbor of Sheboygan, Colonel Graham can dispose of the

machinery and materials remaining on hand to the commissioners, if they desire to purchase them, with the privilege of using the machinery to expend on the work the sum derived from the sale; after which the accounts will be closed.

“Colonel Graham will nominate a successor to the present agent, (if he should resign,) and no objection is perceived to his selecting one of the commissioners, if he find among them a suitable person for the position.

“JEFF’N DAVIS,
“ *Secretary of War.*

“WAR DEPARTMENT, *May 11, 1855.*”

F 29.

Colonel Graham to Colonel Abert.

[No. 88.]

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
Chicago, June 24, 1855.

SIR: In pursuance of your instructions, and those of the War Department, contained in your letter of the 14th ultimo, I have had an interview with the Hon. E. Fox Cook, mayor of Sheboygan, and chairman of the commissioners for the town, charged with the appropriation and expenditure of a sum of money lately raised by it for the improvement of Sheboygan harbor. I have now the honor, in obedience to the above mentioned instructions, to report to you the result of that conference, as follows, viz:

The town of Sheboygan, deeply impressed with the necessity of the speedy improvement of the said harbor, by means of an extension of the present piers, and by dredging out a channel to a depth of at least twelve feet, and being aware that the sum now available for that object, from the last appropriation by Congress, is of itself insufficient for its accomplishment, have raised by private enterprise the sum of twenty thousand dollars, to be added to the government appropriation, for the construction and dredging of the said harbor. The appropriation by Congress to be disbursed by the United States superintending engineer, in accordance with the plans to be approved by the War Department.

The fund raised by the town of Sheboygan is to be disbursed by its own fiscal agent, who alone is to be accountable to the town authorities for its expenditure.

The crib work to be built by the town is to form a separate and entire section, to remain the property of the town. The similar work to be built out of the government appropriation is to form another separate section, exterior or lakeward of that to be built by the town. Both sections, however, are to be constructed in accordance with the

plan of crib work adopted by the War Department. This condition is considered necessary to insure the stability of the the work.

The town commissioners having already procured a dredge-boat, to remain the property of the town, and it being desirable that the harbor should be deepened without delay, it is understood that the United States superintending engineer will, as soon as said dredge-boat arrives at Sheboygan, (being now on its way thither,) take the management of it by the consent and request of the town authorities, and put on board a master and steam engineer, and a crew of his own selection, to operate according to his instructions in dredging out the said harbor; the said master and steam engineer, and crew, and the other current expenses of thus working the said dredge-boat, to be paid by the United States superintending engineer, out of the funds appropriated by Congress for the improvement of this harbor.

The above understanding to be carried out if approved by the proper authority at Washington.

I have respectfully to request that I may be informed if the above arrangement is approved, and I have also to request that measures may be at once taken to draw out of the treasury the balance of appropriation remaining for this harbor, so that it may be made available for the object in view.

The same principle will apply to Milwaukee harbor improvement under the arrangement communicated in detail to the bureau in my letter No. 13, of the 12th of May, last year, and I therefore request that the balance in the treasury appertaining to that harbor may also be at once drawn out, so as to be made available.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj., Top. Eng., Bvt. Lieut. Col., Supt'ng Engineer.

Col. J. J. ABERT,

Chief Topographical Engineers, Washington.

F 30.

Colonel Abert to Colonel Graham.

[Extract.]

BUREAU OF TOPOGRAPHICAL ENGINEERS,

Washington, June 28, 1855.

SIR: Having the directions of the War Department in relation to the work at Sheboygan, your arrangements should be in conformity thereto. But if there be any objections to these, or any special views at variance with them, please make them subjects of special report. In the arrangement reported about Sheboygan, you allude to the pier to be built by the funds of the committee as the property of the town.

The bureau cannot approve of this arrangement. It would probably complicate, or would be considered as prejudging the question of

jurisdiction or control over these piers—a question of serious and profound legal investigation, and of many general considerations.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Col. Corps Topographical Engineers.

Major J. D. GRAHAM,

Corps Top. Eng'rs, Bvt. Lieut. Col. U. S. A.,

Chicago Illinois.

F 31.

Estimate of funds required for the improvement of Sheboygan harbor, State of Wisconsin.

1. For the extension of the harbor piers to a depth of 15 feet outside of the bar off the harbor entrance.

This will require 672 lineal feet of pier work, or 21 cribs, each 32 feet long, by 20 feet wide, and 20 feet average height from bottom to top, constructed according to the plans shown on the accompanying sheet of drawings, marked "G No. 19," or case 1st of crib work.

The cost of each crib will be as follows, (see the preceding table marked T 1.)

Pine timber, hewn or sawed 1 foot square.

For the latticed bottom, 240 lineal feet, at 15 cents per foot.....	\$36 00
For the 3 longitudinal walls, below the water surface, 1,388½ lineal feet, at fifteen cents per foot.....	208 27½
For the three cross walls, below the water surface, 900 lineal feet, at 15 cents	135 00

White oak timber, above water, hewn or sawed 1 foot square, and flooring of 3-inch oak plank.

For the 3 longitudinal walls, the 3 cross walls, 4 sills, and 4 piles, (see drawings,) 880 feet lineal, at 17 cents per foot.....	149 60
For the flooring, 1,482 feet, board measure, of white oak plank, 3 by 8 inches, at \$15 per M.....	22 22

Iron bolts and spikes.

For 3,319 pounds of wrought-iron, 1 inch by 1 inch square, for bolts, at 4 cents per pound.....	132 76
For 137 pounds of wrought-iron, for spikes to fasten flooring to the sleepers, ¾ by ¾ of an inch square, at 7½ cents per pound.....	10 28

Hard boulder stone for crib ballast.

For 63 cords of hard boulder stone, for crib ballast, at \$7 50 per cord of 128 cubic feet	-	-	-	\$472 50
Estimated cost of materials	-	-	-	1,166 63½
For carpentry, labor, and superintendence	-	-	-	400 00
				1,566 63½
Add 10 per cent for contingencies	-	-	-	156 66½
Estimated cost of 1 crib	-	-	-	1,723 30

1. Then, 21 cribs, at \$1,723 30 each, will cost \$36,189 50.

2. Dredging the bar and between the piers to produce a depth of 12 feet.

This will require the excavation and removal of 12,617 cubic yards of sand, and a harder mixture of clay and sand, which we put at the average price of 15 cents per cubic yard, which will amount to the sum of \$1,892 55.

3. For repairing the present harbor piers. I estimate this item at \$5,000.

4. For a set of meteorological instruments for observations at this harbor.

The importance of these observations is shown in the report of the Board of Engineers, hereto attached, marked F 22.

The cost of these instruments will be the same as shown in estimate E 34 for Milwaukie harbor—namely, \$232 50.

RECAPITULATION OF ITEMS IN THIS ESTIMATE.

1. For the extension of the harbor piers to 15 feet water	\$36,189 50
2. For dredging the bar and harbor	1,892 55
3. For repairing the present piers	5,000 00
4. For meteorological instruments	232 50
	43,314 55
From which deduct the balance unexpended of the former appropriation	6,700 00
Amount of appropriation required for this work	36,614 55

J. D. GRAHAM,

Bvt. Lieut. Col., Superintending Engineer, &c., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

F 32.

Statement of the amount of duties collected at the port of Sheboygan, State of Wisconsin, on foreign merchandise, from January 1, 1855, to December 31, 1855, showing also the enrolled tonnage of this port on December 31, 1855, as appears on the records of the custom-house, and showing the number of arrivals and departures at the port of Sheboygan, from March 1, 1855, to December 31, 1855.

Date.	Amount of dues received.	Enrolled tonnage December 31, 1855.	No. of brigs enrolled.	No. of schooners enrolled.	No. of arrivals and departures at the port of Sheboygan from March 1, 1855, to December 31, 1855.	Tonnage of vessels arriving and departing in said period.	Average number of arrivals and departures daily in said period.	Average amount of tonnage daily arriving and departing in said period.
1855.								
January		577 44	1	3	1,598	489,600	5	1,600
February								
March								
April								
May								
June								
July								
August								
September								
October								
November	\$3,975 60							
December								
Total	3,975 60	577 44	1	3	1,598	489,600	5	1,600

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer, &c.

OFFICE OF GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

MICHAEL LYNCH, *Deputy Collector.*

PORT OF SHEBOYGAN, DISTRICT OF MILWAUKIE.

F 33.

Statement of the quantity and value of articles of merchandise received at the port of Sheboygan, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples. ----- barrels	5,360	\$2 25	\$12,060 00
Axes. ----- boxes	1,600	10 00	16,000 00
Barrels, (bulk) ----- number	38,000	10 00	380,000 00
Candy. ----- boxes	1,633	3 00	4,899 00
Candles ----- do	2,346	8 00	18,768 00
Cider and vinegar ----- barrels	879	4 00	3,516 00
Codfish ----- boxes	1,211	12 00	14,532 00
Coffee ----- bags	16,318	13 00	212,134 00
Dried apples ----- bushels	12,000	1 50	18,000 00
Glass. ----- boxes	18,300	2 50	45,750 00
Horses. ----- number	1,220	80 00	97,600 00
Iron. ----- tons	4,657	60 00	279,420 00
Leather. ----- rolls	3,264	60 00	195,840 00
Liquor. ----- barrels	4,912	25 00	122,800 00
Merchandise, as boxes, p'kages ----- number	137,931	29 00	4,000,000 00
Molasses and syrup ----- barrels	5,630	15 00	84,450 00
Nails ----- kegs	14,000	4 00	56,000 00
Oil. ----- barrels	2,898	40 00	115,920 00
Plaster. ----- barrels	100	2 50	250 00
Raisins ----- boxes and kegs	14,728	2 58	38,000 00
Railroad iron ----- tons	994	60 00	59,640 00
Rice ----- tierces	1,200	28 00	33,600 00
Salæratu. ----- boxes	2,543	3 00	7,629 00
Salt. ----- barrels	8,524	1 75	14,917 00
Salt ----- sacks	8,868	12½	1,108 00
Soap ----- boxes	4,000	2 00	8,000 00
Starch. ----- do	2,340	2 50	5,850 00
Stoves. ----- number	10,460	12 00	125,520 00
Steel ----- tons	300	606 66	182,000 00
Sugar. ----- barrels	6,316	15 83	100,000 00
Sugar ----- hogsheads	2,000	70 00	140,000 00
Tea. ----- chests	6,840	20 00	136,800 00
Wagons. ----- number	1,211	80 00	96,880 00
White lead ----- kegs	8,311	2 50	20,778 00
Tobacco ----- pounds	840,000	12	100,800 00
Total value of merchandise received at the port of Sheboygan, Wisconsin, by lake, in the year 1855 -----			6,749,461 60e

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

F 34.

Statement of the quantity and value of articles of merchandise shipped from the port of Sheboygan, Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Barley.....bags--	3,019	\$0 62½	\$1,887 00
Baskets.....number--	4,624	25	1,156 00
Beans.....bags--	249	2 50	622 00
Bedsteads.....sets--	1,852	2 00	3,704 00
Beer.....half barrels--	3,425	3 00	10,275 00
Brick.....M--	160	4 50	720 00
Butter.....kegs--	230	20 00	4,600 00
Chair stuff.....bundles--	493	3 00	1,479 00
Cedar posts.....number--	10,380	6	623 00
Empty barrels.....do--	6,367	1 00	6,367 00
Flour.....barrels--	16,116	8 00	128,928 00
Flour.....bags--	2,316	4 00	9,264 00
Furs.....bales--	33	87 87	2,900 00
Grass seed.....barrels--	20	7 25	145 00
Grass seed.....bags--	1,217	3 00	3,651 00
Green hides.....number--	2,338	3 00	7,014 00
Household goods.....barrels bulk--	10,000	10 00	100,000 00
Laths.....M--	2,934	4 50	13,203 00
Lumber.....M feet--	6,644	16 00	106,304 00
Patent pails.....dozens--	498	2 00	996 00
Pork.....barrels--	223	16 00	3,568 00
Potatoes.....sacks--	14,183	1 50	21,275 00
Pot ashes.....casks--	359	25 00	8,975 00
Rye.....bushels--	120	1 00	120 00
Saleratus.....boxes--	1,224	3 00	3,672 00
Shingles.....M--	8,062	3 75	30,233 00
Square timber.....M feet--	9	125 00	1,125 00
Wagon hubs.....sets--	5,000	50	2,500 00
Wagon spokes.....M--	350	8 00	2,800 00
Wheat.....bushels--	195,450	1 50	293,175 00
Wheat.....bags--	47,457	3 93	186,530 00
White fish.....half barrels--	2,951	3 50	10,329 00
Whiskey.....barrels--	47	12 00	564 00
Wool.....sacks--	498	70 00	34,860 00
Total value of merchandise shipped from Sheboygan, Wisconsin, in the year 1855.....			1,003,564 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

F 35.

Statement of the quantity and value of articles of merchandise received at the port of Sheboygan, State of Wisconsin, having come over St. Clair flats, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....barrels..	4,860	\$2 25	\$10,935 00
Axes.....boxes..	1,400	10 00	14,000 00
Candles.....do..	1,016	8 00	8,128 00
Barrels, bulk.....number..	25,000	10 00	250,000 00
Candy.....boxes..	1,500	3 00	4,500 00
Cider and vinegar.....barrels..	230	4 00	920 00
Codfish, boxes.....boxes..	506	12 00	6,072 00
Coffee.....bags..	12,500	13 00	162,500 00
Dried apples.....bushels..	11,046	1 50	16,569 00
Glass.....boxes..	15,400	2 50	38,500 00
Horses.....number..	406	80 00	32,480 00
Iron.....tons..	3,068	60 00	184,080 00
Leather.....rolls..	2,560	60 00	153,600 00
Liquor.....barrels..	800	25 00	20,000 00
Merchandise, as boxes and packages.....number..	125,000	28 00	3,500,000 00
Molasses and syrup.....barrels..	3,450	15 00	51,750 00
Nails.....kegs..	12,000	4 00	48,000 00
Oil.....barrels..	2,203	40 00	88,120 00
Plaster.....do..	100	2 50	250 00
Raisins.....boxes and kegs..	12,200	2 87	35,000 00
Railroad iron.....tons..	994	60 00	59,640 00
Rice.....tierces..	1,200	28 00	33,600 00
Saleratus.....boxes..	1,598	2 50	3,995 00
Salt.....barrels..	8,524	1 75	14,917 00
Steel.....tons..	300	606 66	182,000 00
Salt.....sacks..	2,650	12½	325 00
Soap.....boxes..	1,200	2 00	2,400 00
Starch.....do..	1,115	2 50	2,787 00
Stoves.....number..	7,390	12 00	88,680 00
Sugar.....hogsheads..	1,100	70 00	77,000 00
Sugar.....barrels..	4,861	16 45	80,000 00
Tea.....chests..	2,130	22 00	46,860 00
Tobacco.....pounds..	600,000	12	72,000 00
Wagons.....number..	520	80 00	41,600 00
White lead.....kegs..	5,076	2 50	12,690 00
Total value of merchandise received at Sheboygan, Wisconsin, which came over St. Clair flats, being a part of the preceding statement, in the year 1855.....			5,343,898 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

F 36.

Statement of the quantity and value of articles of merchandise shipped from the port of Sheboygan, State of Wisconsin, having passed over St. Clair flats, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Butter ----- barrels--	14	\$38 00	\$532 00
Butter ----- kegs--	124	18 00	2,232 00
Fish ----- half barrels--	70	7 00	490 00
Flour ----- bags--	227	4 00	908 00
Flour ----- barrels--	8,723	8 00	69,784 00
Furs ----- bales--	33	87 87	2,900 00
Grass seed ----- bags--	262	3 00	786 00
Green hides ----- number--	247	3 00	741 00
Household goods ----- boxes--	143	10 00	1,430 00
Oak staves ----- M--	3	9 00	27 00
Potatoes ----- bags--	150	1 24	186 00
Pot ashes ----- casks--	250	25 00	6,250 00
Rye ----- bushels--	120	1 00	120 00
Saleratus ----- boxes--	75	3 00	225 00
Wagons ----- number--	2	85 00	190 00
Wheat ----- bags--	32,470	2 64	85,733 00
Wheat ----- bushels--	195,450	1 50	293,175 00
Wool ----- sacks--	444	70 00	31,080 00
Total value of merchandise shipped from Sheboygan, Wisconsin, and passed over St. Clair flats, being a part of the preceding statement of shipments, in the year 1855-----			496,789 00

J. D. GRAHAM,

Brevet Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

7.—MANITOWOC HARBOR, WISCONSIN.

In my general report to the Topographical Bureau, No. 73, of April 29, 1855, the work for the improvement of this harbor was mentioned as follows, viz:

“Under your instructions of the 27th of April, 1854, the position and direction for the piers for the improvement of this harbor, in accordance with the approved plan, were marked out by me upon the locality designated, and proposals were immediately invited for the necessary materials for construction, (see G 1.) Owing to the failure of the first contractor (David Smoke) for supplying the necessary timber, a delay was caused of about one month in commencing the work. A new contract was made (with other parties) and was fulfilled, and the work of constructing the cribs was begun on the 10th day of July, 1854, and continued until the close of the working season. Seven

cribs, each 30 feet long and 20 feet wide, have been sunk in position and filled with stone. Two of these are upon the north side, and five are upon the south side, making the length of the north pier at present 60 feet, and the length of the south pier 150 feet, with a width of channel between them of 212 feet.

"These piers are upon a magnetic course of N. 85° 30' E., as observed the 9th of May, 1854. As the United States steam dredge-boat could not be withdrawn from the harbors of Chicago and Racine for the purpose of sending her to so great a distance as Manitowoc to dredge out a bed for the cribs there, these cribs had to be sunk upon the natural bottom, which, being somewhat irregular, has caused the cribs to tilt a very little in settling, notwithstanding they were constructed with open grillage bottoms, formed by transverse timbers, laid parallel and with spaces of one foot between them, consecutively. I afterwards determined that the interstices of the grillage bottom should always be, in their least dimension, not less than 2 feet and 2 inches for the minimum size of stone used.* These cribs have settled down into the soil at bottom, generally as much as from 1½ to 3 feet, and now require to be built up as much as they have sunk, in order to preserve a height of 5 feet above the water-level.

"The funds appropriated for this harbor are all expended, except the sum of \$200 reserved to pay Messrs. Sweet, Ives & Hawley for 4,000 pounds round bolt iron, delivered to Agent Temple Clark for the use of this harbor last season; and also reserving what was estimated to be the balance that would be due to the said agent for his services to October 31, 1854, on a final settlement of his accounts with the Treasury Department.

"The agency expired on the last mentioned date, under the regulation of the War Department of October 11, 1854.

"There is dressed timber enough on hand at Manitowoc to build the cribs up to the desired height above the water level. There are also iron and stone enough on hand, to be used in thus completing them. As the pile-driver, stone scow, Manilla rope, and a portion of the tools will not be required at this harbor until another appropriation shall be made to extend the piers out to the desired depth of water, and as there are no funds to pay a custodian for taking care of them, I recommend that I be authorized at once to transfer them to Sheboygan harbor, where they are needed, at their present value. The pile-driver and scow are new; and as they were substantially built, under the supervision of Agent Temple Clark, their cost to Sheboygan will be less than what they could be procured for by contract. I recommend that the fund raised in this way be applied to the payment of the mechanics and laborers in building up the Manitowoc piers to the proper height. I respectfully ask an early decision on this point, as I defer procuring these necessary articles for Sheboygan by contract until a decision is made on this subject.

"Agent Clark was instructed, in September last, to make a survey of the mouth of Manitowoc river and the adjacent portion of the lake, so as to show the facilities and obstructions to navigation in approaching

* See document marked G 2, hereto attached.

and entering that harbor; and he was instructed to forward a plat and the note-books of his survey to this office, in order that a map might be projected from them.* He has failed, although several times called upon, to forward the notes of survey. I am not enabled, therefore, to present an authentic map of this harbor."

The above extract gives a full account of all the work that has been done for the improvement of this harbor. It shows a good beginning; and although only a beginning, I will add that its good effects have already been felt and appreciated by the commercial interests of Manitowoc and the adjacent country.

It is very important to the agricultural interests of the country west of Manitowoc, and between that place and Green Bay, that this harbor should be completed, by extending the piers out to twelve feet depth of water in Lake Michigan, in accordance with the approved plan. To do this will require that the north pier be extended 864 feet, and the south pier 768 feet, according to the best reconnaissance I was enabled to obtain. This will require the addition (for both piers) of 1,632 feet of pier work, in an average depth of eight feet water; or the construction of 51 cribs, each 32 feet long by 20 feet wide, and 13 feet average height from bottom to top.†

Manitowoc river throws down a large volume of water, during its high freshets, into Lake Michigan—sufficient, it is believed, to scour a channel between the piers 240 feet wide. This was represented in my general report, (No. 32,) of August 19, 1854, and that width was recommended to be adopted for the channel-way between the piers, in lieu of 200 feet previously decided on. This recommendation was acceded to,‡ but before information to that effect reached this office, both piers had already been commenced at the previously determined width apart.

For reasons similar to those given in reference to Sheboygan harbor in this report, I recommend that, in extending the Manitowoc piers, a width of channel of 240 feet be immediately assumed, by obliquing the three first cribs to be added to the south pier, so as to gain the additional width necessary for that purpose; and that the south pier be afterwards prolonged in a direction parallel to the north pier.

Besides the pier extensions, dredging will be required between them and over the bar at the harbor entrance, in order to give a channel of 12 feet, as follows, viz: light sand to the amount of 12,500 cubic yards; a harder mixture of clay and sand 6,200 cubic yards.

I herewith submit an estimate, marked G 4, for these improvements, including also an item for meteorological instruments, which calls for an appropriation for the improvement of Manitowoc harbor of

* See document marked G 3, hereto attached.

† The Board of Engineers, in their report upon this harbor improvement of April 17, 1854, (see Senate Doc. No. 1, Executive, 33d Congress, 2d session, part 2, p. 244,) assume 1,000 feet as the length of pier work necessary to extend both piers to a depth of 12 feet water in the lake. My own reconnaissance, made in May, 1854, gave the distance from the shore to 12 feet depth, outside of the bar, to be in accordance with my statement above. Understanding the leading principle laid down in the plan of the board to be, that the piers shall extend to 12 feet depth of water beyond the bar, I have made my estimates accordingly. I would recommend that they should extend to that depth at least. J. D. G.

‡ See Senate Doc. No. 1, Executive, 33d Congress, 2d session, part 2, page 247.

\$62,780 92 ; that is to say, sixty-two thousand seven hundred and eighty dollars and ninety-two cents.

The importance of meteorological observations, in order to ascertain carefully the direction of the prevailing storms and their influence upon the direction and force of the drift which forms the obstructing bars at this harbor, is forcibly set forth by the remarks of the Board of Engineers in their reports of April 17, 1854, and May 18, 1854,* and I request that I may be supplied with the requisite instruments for instituting them. If they be neglected, a very important problem, to decide the best direction for the piers here, will be left in doubt.

Manitowoc is a port of delivery for foreign importations, and belongs to the Mackinac district. A deputy collector is stationed here. There is a coast light-house here, situated within the town, on the high bank of the lake shore. It bears north $35^{\circ} 10'$ west, and is distant 125 yards from the harbor entrance.

The accompanying statement, marked G 5, shows that the enrolled tonnage belonging to this port on the 31st of December, 1855, consists of five schooners, amounting to 755 tons.

The number of arrivals and departures to and from this port, from March 1 to December 31, 1855, was 1,644 ; or an average per day for that period of 5.3.

The total amount of tonnage arriving and departing during that period was 812,910 tons ; or an average per day during that period of 306 days, of $2,656\frac{1}{2}$ tons.

No duties on foreign importations were collected at this port during the year 1855.

The value of merchandise received at this from other

United States ports, by lake shipments, during the year 1855, was, as per accompanying statement, marked G 6.....

\$305,126 00

The value of merchandise shipped from this port to other ports in 1855 was, per accompanying statement G 7..

446,499 40

Total value of receipts and shipments in 1855, all by lake vessels.....

751,625 40

The value of produce received at this port by land transportation from the country during the year 1855 was, as per accompanying statement, marked G 8.....

43,000 00

Total value of receipts by lake and by land, and of lake shipments, at the port of Manitowoc, Wisconsin, in 1855.....

794,625 40

I had no means of obtaining, with accuracy, the quantity and value of merchandise which were sent from Manitowoc by land transportation into the surrounding country, such as dry goods, groceries, wearing apparel, &c. If these could have been added, it would, I believe, have shown the trade of Manitowoc to have amounted in the year 1855 to full one million of dollars, (\$1,000,000.) I am indebted to

* See the same document, page 244, and again page 247.

C. W. Fitch, esq., for valuable assistance in obtaining the statistics for this port.

One or two railroads are in contemplation from Manitowoc to the west and northwest. These improvements would greatly increase the commerce of this port.

Manitowoc is the most northern of the harbors of Lake Michigan improved by the United States. It derives additional importance from the fact that, when completed, it will afford the first point of refuge from storms for shipping bound from any of the other great lakes to this or to the most southern ports of Lake Michigan. It appears very important to the commerce of the lakes generally that there should be a good harbor here.

Respectfully submitted.

J. D. GRAHAM,
Major Top. Eng., Bt. Lt. Col., Supt. Eng., &c.

G 1.

Colonel Graham to Colonel Abert.

[No. 12.]

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
Manitowoc, May 10, 1854.

SIR: I have the honor to report to you that I have laid out the work for the construction of the piers for the improvement of the harbor at this place, and have advertised for proposals for the delivery of the materials for constructing eight cribs of 30 by 20 feet each, one-half to be delivered on or before the 15th of June, and the other half by the 15th of July ensuing.

I herewith enclose an estimate for funds that will be required for this work to pay for materials and labor for the month of June, 1854, amounting to \$2,121.

Upon the plan furnished by the Board of Engineers, the direction for the piers is laid down and marked in writing as north $85\frac{1}{2}^{\circ}$ east, magnetic. In the text of the instructions of the board, however, the course is stated at south $83\frac{1}{2}^{\circ}$ east, or east half south nearly, showing a discrepancy (from an error of copying, no doubt) of eleven degrees in the direction between the text and the drawn plan. I have laid out the work in conformity with the drawing, that is to say, upon a course of north $85\frac{1}{2}^{\circ}$ east, *magnetic*, and beg to be informed if this is correct. If any change is required, it can easily be made before the materials can be delivered for beginning the work.

I propose to place the eight cribs, all towards the forming of the south pier, which will give 240 feet in length, where protection is most needed.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieut. Col., Sup. Eng. Lake Michigan Works.

Colonel J. J. ABERT,
Chief Top. Engineers, Washington.

G 2.

Colonel Graham's instructions to Agent Temple Clark, in reference to the method adopted for building cribs.

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
Chicago, August 31, 1854.

SIR: In your future advertisements and contracts for timber for crib-work, you will please be governed, in dimensions, by the bill of timber herewith forwarded, marked T 1.

Each crib will be thirty-two feet long, measured upon the outside and middle walls, and twenty feet wide, and will conform in plan and dimensions with the model herewith forwarded, except that the middle longitudinal wall, or tier of stringers, will be composed of timbers thirty-two feet long, instead of thirty feet, as represented in the wooden model.*

Each end wall will be retired two feet within the extremities of the two outside and the middle longitudinal walls.

This gives for the dimensions of each of the four compartments, measured in the interior, $12\frac{1}{2}$ feet long by $8\frac{1}{2}$ feet wide.

The cribs will not be locked one with another, by halving a portion of the longitudinal timbers at their extremities, because, in that case, if a crib should tilt to one side and its neighbor not, or if one should tilt more than the other, the halved portion, made to form the lock, would sliver on one side, and thus destroy the effect of the outer tier of iron bolts and weaken the joints at the cross-ties. The grillage, to form the bottom of each crib, will be composed of six cross timbers, each twenty feet long and 12" by 12", and four longitudinal timbers, each resting upon the six cross pieces, as is shown in the model, without locking together or letting one into another by notching. These grillage timbers are only locked with the wall timbers at the crossings; the longitudinal ones with all three of the cross walls of the crib, and the cross or lower timbers of the grillage with the two outside longitudinal walls, *only*. This leaves a vacant space of six inches in height between each cross timber of the grillage and the timber next above it belonging to the middle longitudinal wall. In the course of construction this vacancy is filled by two timbers spiked on, each twelve and a half feet long and twelve inches broad, by six inches high, thus completing the solidity of the middle longitudinal wall throughout. These two short timbers are pushed diagonally a little out of place in the wooden model, in order to attract attention, but are easily pushed back into place. There are forty-eight interstices in the bottom of the crib, (twelve in each compartment,) each giving a clear open space $2' 4\frac{1}{2}"$ long by $2' 2"$ wide, to allow the stone to pass freely through in case of the crib tilting to one side.

An *enrochement* will thus be formed, tending to check the undermining effect of the current and to produce a firm base of support. The bolting together of the timbers of the grillage will be as shown in the

* Sheet G No. 19, accompanying this report, gives drawings of all these details.
DECEMBER 31, 1855.

accompaning drawing, marked fig. 1 of sheet G No. 19. The bolting of the timbers which form the three transverse walls will be as represented in the vertical section, marked fig. 3. That of the three longitudinal walls will be as shown in the vertical sections, marked fig. 5, for the outside walls, and fig. 6, for the middle wall.

Fig. 7 is a horizontal projection, or view from above, of two cribs finished and sunk. The first and second compartments on the left are empty, to show the grillage and the soil at the bottom through the interstices. The third and fourth compartments are represented as being filled with stone to the water-level. The termination of the first crib, and the left-hand half of the second crib, show the stone filling, and also the mode of laying and bolting on the sleepers 6" by 9" that are to support the plank flooring. The right-hand half of the second represents the work as completed, with the flooring let into the upper timbers of the two outside walls and spiked on to the sleepers. You will observe the manner of breaking joints of adjacent cribs in the timber forming the three longitudinal walls above the water surface is shown in figure 8,* as also the mode of bolting the timbers together at the joints. The laying of the timbers above the water-level is not shown in the wooden model. No piles will be allowed within any part of a crib. They may be driven upon the proper directions before the cribs are sunk, to serve as guides in the alignment; or they may be suspended within iron bands fastened on the outsides of the cribs and floated out with them, and then let down in the usual way, when the exact alignment is obtained, and then driven, to serve for vessels to make fast to when lying near the piers.

In order to establish uniformity in the system for pier structures on the harbor improvements of Lake Michigan, models have been, or will be, distributed at the different works, similar to that now sent to you, which will be borne on the quarterly returns of public property; also a bill of timber for a crib of any height, showing the dimensions to be observed in advertising for proposals similar to that herewith enclosed, marked T 1.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Sup'g Eng. &c., &c., &c.

TEMPLE CLARK, Esq.,

U. S. Agent, Manitowoc, Wisconsin.

G 3.

Colonel Graham's instructions to Agent Temple Clark, in relation to making a survey of Manitowoc harbor.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, September 19, 1854.

SIR: You will make a survey of the entrance to Manitowoc river and the adjacent lake shore, and up that river to a point five hundred

* This scarfing or breaking of joints in the timbers above water, for the purpose of uniting the several cribs, was afterwards rejected.—(See this report, *ante*.) J. D. G.

feet above the floating or drawbridge, in the following manner, referring to the accompanying map of the town for explanation :

1. You will make an accurate survey by means of a compass and an iron chain (well tested in length by the standard rod sent to you) from the mouth of the river at *a*, to a point 1,300 feet northerly from that point. A stake will be firmly driven at each 200 feet of distance, and plainly marked with red chalk, *a*, *b*, *c*, &c., to *f*, as shown on the map. You will then again place your compass at *a*, and drive a stake due south of it by compass, and mark it "station 12." Measure the distance from *a* to 12. Then survey the lake shore to the southward, a distance of 1,800 feet from *a*, driving stakes at every 200 feet from *a*, marking them 13, 14, *l*, *m*, *n*, *o*, *p*, and *q*. Stake 15 is to be on the shore in range with the north face of the warehouse. As you survey this shore, note the distance from stake 15, at which you cross the middle point (marked thus $\odot$) of the bridge piers. Then return to this pier (after the south shore is finished) and run a line down the middle of it from the eastern end *g* to the said point marked $\odot$, and note each 200 feet from *g* by a notch, and mark these points with red chalk, *h*, *i*, *k*.*

2. The stake *a* should be connected by compass courses with the stakes I drove in May last on the north side, and also with the southeast corner of Jones' warehouse. Also, in your survey of the lake shore to the north, connect, from the most convenient station by a compass course and measured distance, with the light-house, so as to be able to plot it correctly in position.

3. Then sound all the lines radiating from the point *a*, as shown on the map, running each line out to as deep water as you can conveniently reach, say to 24 or 30 feet, but always to as much as 20 feet, if it be practicable. The first course, you will remark, is north 30° east, then north 45° east, north $52^{\circ} 30'$ east, north 60° east, &c., &c., round to south 65° east. Your effort will be so to throw your anchor that when your buoy is attached to the end of your line, just above the anchor, the buoy shall have the bearings indicated on the map as near as practicable. It will seldom, if ever, have these *exact* bearings; therefore, after the buoy has settled to its position, in each case observe its *actual* bearing and record it, and this is the bearing that must afterwards be plotted upon the map as the true line upon which the soundings are to be laid down. It might happen that you would not in any case have a course *exactly* as laid down on the map herewith sent, but this will be no matter of consequence, provided, in each case, you have an approximation to it.

The next lines to be sounded will be *a g*, *a h*, *a i*, *a k*.

4. Then from the stakes *f*, *e*, *d*, *c*, *b*, *a*, 13, 14, 15, *l*, *m*, *n*, *o*, *p*, and *q*, lines should be sounded on a course, each south 84° east, or as near that course as practicable, always continuing out to 20 feet water, at least, and more if within convenient distance. It is not necessary to have the soundings taken along your guide line nearer together than

*I recommend *red chalk*, because, if well marked, it will remain indelible to rain and weather for a long time, perhaps for years, and the distance thus marked may be used again hereafter.

30 or 35 feet. If closer together they cannot well be laid down on a map of the scale we are obliged to use.

5. Your next attention will be to the river. Let stakes be driven on the north shore at the distances from the point *a* marked upon the map, and put the same marks upon them in red chalk.

The three first stations are 50 feet apart, each, from its predecessor.

After these stakes are driven and thus marked, let stakes be set up on the opposite side of the river, due south of those on the north side by compass courses, and marked as on the accompanying map. Then sound on the lines *a* 12, *r* 11, *s* 10, *t* 9, *u* 8, *v* 7, *w* 6, &c., to 1, 2. To complete the work, now let the two diagonals of each of these parallelograms be sounded, viz: *a* 11, *r* 12, *r* 10, *s* 9, *s* 11, *t* 10, *u* 9, *t* 8, *u* 7, *v* 8, *w* 7, *v* 6, *w* 5, *x* 6, *y* 5, *x* 4, *y* 3, *z* 4, *z* 2, and 1, 3.

6. Before you proceed to set down the depths in your note-book, let each line be distinctly indicated, thus, suppose a case:

Sounded from *a* on a course north 30° east, 3.2 — 4.5 — 7.3 — 8.1 — 10.0 — 11.3 — 12.6 — 12.8 — 13.7 — 14.0 — 16.2 — 17.8 — 19.0 — 20.5 — 22.2 — 24.4 — 26.3 — 28.1 — 29.7 — 30.3; the line sounded is 700 feet long, spaces 35 feet apart.

Then sounded from *a* to *g*, &c., &c., and so on in a like manner, throughout.

When the work is all plotted, you will forward the original note-books and plot to this office, where the map will be drawn by draughtsmen employed for the purpose. It will not probably be necessary to survey the shores of the river higher up than the stations marked *v* and 7, as it is supposed they cannot have changed above these points since the survey was made from which the accompanying map was drawn. The distances must be laid off, however, for placing the stakes to be used in the soundings, and it would be well as you do so to take in by notes and offsets the lines of the streets as you pass them, and the ends of the drawbridge, for the sake of verification.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer.

TEMPLE CLARK, Esq.,

United States Agent, Manitowoc, Wisconsin.

P. S.—If the bridge pier has been lengthened beyond what is laid down on the accompanying map, please mention its whole present length. And if any other bridge piers or wharves have been built, please lay them down accurately on your survey.

J. D. G.

G 4.

Estimate of funds required for the improvement of Manitowoc harbor, Wisconsin.

1. For 1,632 feet of pier work for the extension of the north pier 864 feet and the south pier 768 feet.

This will require 51 cribs, each 32 feet long by 20 feet wide, with an average height of 13 feet; the average depth of water being 8 feet. The extension will reach to a depth of 12 feet of water.

The cost of each crib will be as follows, constructed according to case first, shown by the drawings in sheet G No. 19.—(See also the preceding formula of computation.)

For 1,437 feet lineal of hewn or sawed pine timber, 1 foot square, at 14 cents per lineal foot.....	\$201 18
For 880 lineal feet of white oak timber, hewn or sawed 1 foot square, at 17 cents per lineal foot.....	149 60
For 1,482 feet, board measure, of white oak plank, 3 by 8 inches, for flooring, at \$15 per thousand feet.....	22 22
For 2,136 lbs. of inch square wrought-iron for bolts, at 4 cents per lb.....	85 44
For $136\frac{8}{10}$ lbs. of wrought-iron spikes to fasten the flooring to the sleepers, at $7\frac{1}{2}$ cents per lb., (size of spikes $\frac{3}{8}$ inch square).....	10 26
For $39\frac{8}{10}$ cords of hard boulder stone for crib ballast, at \$7 50 per cord of 128 cubic feet.....	298 50
Estimated cost of materials.....	767 20
For carpentry, labor, and superintendence.....	300 00
	1,067 20
Add 10 per cent. for contingencies.....	106 72
Estimated cost of 1 crib.....	1,173 92

1. Then, 51 cribs, at \$1,173 92 each, will cost \$59,869 92.

2. *For dredging so as to produce a depth of 12 feet between the piers and over the bar at the harbor entrance.*

For the excavation and removal of 12,500 cubic yards of light sand, at $12\frac{1}{2}$ cents per cubic yard.....	\$1,562 50
For the excavation and removal of 6,200 cubic yards of a harder mixture of clay and sand, at 18 cents per cubic yard.....	1,116 00
2. Amount required for dredging.....	2,678 50

3. *For meteorological instruments for observation at this harbor.*

This item will be the same as in estimate E 34, for Milwaukie harbor, viz: \$232 50.

Recapitulation of items in estimate G 4.

1. For the extension of the harbor piers.....	\$59,869 92
2. For dredging.....	2,678 50
3. For meteorological instruments.....	232 50
Amount of appropriation required.....	62,780 92

NOTE.—The balance on hand of \$526 appertaining to this harbor is not deducted from the above amount, because this balance is applicable to the payment of claims on the former appropriation, as mentioned in the body of this report.

J. D. GRAHAM,
Bvt. Lieut. Col., Superintending Engineer, &c.
 OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

G 5.

Statement of the amount of duties collected at the port of Manitowoc, State of Wisconsin, on foreign merchandise, from January 1, 1855, to December 31, 1855, showing also the enrolled tonnage of this port on December 31, 1855, as appears on the records of the custom-house, and showing the number of arrivals and departures at the port of Manitowoc, from March 1, 1855, to December 31, 1855.

Amount of duties received each month, from January 1, 1855, to December 31, 1855.....	None.
Enrolled tonnage, December 31, 1855.....	755 39
Number of schooners enrolled.....	5
Number of arrivals and departures at the port of Manitowoc, from March 1, 1855, to December 31, 1855.....	1,644
Tonnage of vessels arriving and departing in said period.....	812,910 46.59
Average number of arrivals and departures daily in said period.....	5
Average amount of tonnage daily arriving and departing in said period.....	2,656 5.10

Manitowoc has been a port of clearance but little over a year, which may account for the absence of duties in this report. Three schooners are building here at the present time, which will increase our tonnage to over 1,000 at the opening of navigation in 1856. At Two Rivers, seven miles north, 4 schooners are owned; aggregate tonnage, 553. Two vessels are building there, which will increase it to 800 tons. In other respects, their statistics will amount to full half of those given for Manitowoc.

J. D. GRAHAM,
Brevet Lieutenant Colonel, Superintending Engineer.
 OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

C. W. FITCH,
Deputy Collector for Manitowoc, Wisconsin.

G 6.

Statement of the quantity and value of articles of merchandise received by lake shipments at the port of Manitowoc, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels..	650	\$2 50	\$1, 625 00
Bricks ----- M-----	50	7 00	350 00
Coal ----- tons -----	35	10 00	350 00
Horses ----- number -----	39	100 00	3, 900 00
Iron ----- tons -----	184	90 00	16, 560 00
Machinery ----- do -----	150	200 00	30, 000 00
Nails ----- kegs -----	2, 878	5 00	14, 390 00
Molasses ----- barrels..	712	20 00	14, 240 00
Salt ----- bags -----	6, 100	15	915 00
Salt ----- barrels..	2, 115	2 00	4, 230 00
Sleighs ----- number -----	8	35 00	280 00
Sugar ----- barrels..	1, 020	20 00	20, 400 00
Sugar ----- hhds -----	181	100 00	18, 100 00
Vinegar ----- barrels -----	159	5 00	795 00
Wagons and buggies ----- number..	12	75 00	900 00
Whiskey ----- barrels -----	427	15 00	6, 405 00
Value of merchandise, taken from warehouse and mercantile books and bills, not included above -----			171, 686 00
Total value of merchandise received by lake shipment, at Manitowoc, in 1855 -----			305, 126 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31 1855.

G 7.

Statement of the quantity and value of articles of merchandise shipped by lake vessels from the port of Manitowoc, Wisconsin, during the year ending September 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Cedar posts ----- M -----	134	\$50 00	\$6,700 00
Fish ----- half barrels -----	1,820	4 50	8,190 00
Flour barrels ----- number -----	500	50	250 00
Furs -----			1,000 00
Laths ----- M feet -----	6,600	4 00	26,400 00
Leather ----- pounds -----	5,136	40	2,054 40
Lumber ----- M feet -----	17,675	12 00	212,100 00
Pickets ----- M -----	60	8 00	480 00
Railroad ties ----- number -----	1,000	12½	125 00
Schooners built for Chicago ----- do -----	2	{ 6,000 00 } { 9,000 00 }	15,000 00
Shade trees ----- do -----	1,000	50	500 00
Shingles ----- M -----	60,600	2 75	166,650 00
Square timber ----- M feet -----	10	100 00	1,000 00
Spokes ----- M -----	5	10 00	50 00
Wood ----- cords -----	3,000	2 00	6,000 00
Total value of merchandise shipped by lake vessels from the port of Manitowoc in 1855 -----			446,499 40

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

G 8.

Statement of the quantity and value of articles of merchandise received by land transportation at the port of Manitowoc, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beef ----- tons -----	50	\$160 00	\$8,000 00
Butter ----- pounds -----	5,000	20	1,000 00
Corn meal ----- tons -----	50	40 00	2,000 00
Flour ----- barrels -----	2,000	8 00	16,000 00
Pork ----- tons -----	100	160 00	16,000 00
Total value of merchandise received at Manitowoc, Wisconsin, by land transportation, in the year 1855 -----			43,000 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

PART II.

Lieutenant Colonel J. D. Graham's annual report (No. 161) upon the harbor works under his direction on Lake Michigan and Lake St. Clair, for the year 1856.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, November 15, 1856.

I certify that the within is a true copy of my annual report for 1856 to the Topographical Bureau.

J. D. GRAHAM,
Major Top. Eng., Brevet Lieut. Col., Sup. Eng., &c., &c.

THE IMPROVEMENT OF THE FOLLOWING HARBORS IS EMBRACED IN THIS
REPORT, VIZ:

1. Chicago harbor, Illinois.
 2. Waukegan breakwater, Illinois.
 3. Kenosha harbor, Wisconsin.
 4. Racine harbor, Wisconsin.
 5. Milwaukie harbor, Wisconsin.
 6. Sheboygan harbor, Wisconsin.
 7. Manitowoc harbor, Wisconsin.
 8. Michigan City breakwater, Indiana.
 9. New Buffalo harbor, Michigan.
 10. St. Joseph harbor, Michigan.
 11. Black Lake harbor, Michigan.
 12. Grand Haven harbor, at the mouth of Grand river, Michigan.
 13. St. Clair flats, Michigan.
 14. Mouth of Clinton river, Michigan.
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Report of Brevet Lieut. Col. James D. Graham, Major of United States Topographical Engineers, upon the lake harbor improvements under his direction, during the year 1856.

OFFICE GENERAL SUPERINTENDENCE OF
LAKE MICHIGAN AND LAKE ST. CLAIR HARBOR WORKS,
Chicago, November 15, 1856.

SIR: I have the honor to submit to you this my annual report upon the works under my direction for the year 1856. They embrace the harbor works for Lake Michigan and Lake St. Clair.

I.—LAKE MICHIGAN HARBOR WORKS.

1.—CHICAGO HARBOR, ILLINIOS.

At the date of my last annual report (the 31st of December, 1855,) this harbor was closed with ice. The winter was severe, but unusually dry. The lowest register of the thermometer was thirty degrees below zero (0) of Fahrenheit's scale, which occurred on the 9th of January, 1856. It is a rare occurrence for it to fall lower here than fifteen degrees below zero of this scale during a winter season. I have to repeat here my regret at the want of a full set of meteorological instruments, to be observed on in connexion with our tide register at this place, and beg leave to refer, upon this point, to the remarks made in my last annual report.—(See printed Senate Executive Document No. 77, of the 34th Congress, 1st session, pages 32 to 34; see, also, a reprint of the same, contained in Part I of this volume.)

The harbor continued to be closed with ice against the entrance and departure of vessels until the 23d of March, and on the 24th the schooner Liberty, from Racine, entered this port. On the 26th she sailed again for Racine, and the steamer Huron departed for Milwaukee.

Immediately on the opening of the harbor, so as to allow the free use of our surveying boats, a survey was made of the harbor and bar, and of Chicago river as high up as Clark Street bridge. The result of this survey, accomplished between the 29th of March and the 9th of April, 1856, is shown in full detail on the accompanying map, marked "map G No. 38," projected on a scale of $\frac{1}{2400}$, or 200 feet to one inch.—(See document A 1, hereto attached, containing sailing directions.

It will be remembered that in April, 1854, immediately after taking my station here, I submitted a map, from actual survey, marked "map G No. 11," showing the condition of this bar and of the harbor entrance at that period. On the 19th of August, 1854, I submitted another map, marked "G No. 12," showing the condition of this harbor and the remnant of the bar after the dredging out, between the 18th of May and the 22d of July of that year, of a ship-channel 12 feet deep, affording a direct entrance near the north pier-head for vessels of the greatest draught of water navigating our great lakes. These two maps were forwarded with my annual report of the 31st of December last, (No. 116 of my series,) together with maps "G No. 22," and "G No. 23," showing, also, the condition of the harbor and bar, from very careful surveys made at the respective periods of June, 1855, and October 12, 1855.

The above mentioned four maps, marked "G No. 11," "G No. 12," "G No. 22," and "G No. 23," should have been printed with Part I of my annual report of December 31, 1855, to be found in the Senate Executive Document No. 77, of the 34th Congress, 1st session, and also in Part I of this volume; but, by some oversight, they are omitted. They are now in possession of the Superintendent of Public Printing or the Clerk of the Senate, for that purpose, if it be desired.

In comparing them with the map "G No. 38," it will be seen that there is a fixed law of nature, operating with surprising uniformity amidst all the vicissitudes of winds and storms, in giving an unvarying character to this bar.

The opinion expressed in my last annual report has been strengthened by further observation: that the most certain and economical mode of keeping this bar so far subdued as to insure constantly a ship-channel 12 feet deep, and of sufficient width to admit of the free and safe entrance of vessels of the largest class now navigating the great lakes by passing near to the north pier, is by constant dredging.

It was remarked in that report that the excellent ship-channel dredged out in the summer of 1854, and shown on map "G No. 12," was filled up by the natural deposit of silt brought from the north by the littoral current during the succeeding winter and spring, and the bar was thus brought to the same condition which it was in at the end of April, 1854, as shown by a comparison of maps "G No. 11" and "G. No 22." A reference to the map "G No. 38," herewith presented, shows that it remained in the same unfavorable condition up to the period of April, 1856.

On the 29th of April, 1856, the dredging out of a ship-channel through this bar was commenced, for the second time, under my direction, by the use of the United States steam-dredge, constructed for the benefit of all the harbors on Lake Michigan.

The dredging was continued every day that the weather and sea were favorable, Sundays excepted, until the 3d of the present month of November, 1856.

Statement of the quantity of sand and earth excavated and removed from the bar, and of the number of days the dredge was capable of working during that period.

Date.		No. of cubic yards excavated and removed.	Date.		No. of cubic yards excavated and removed.
1856.			1856.		
April	22.....	360	June	11.....	240
	23.....	456		12.....	336
	29.....	144		16.....	408
May	8.....	144		18.....	456
	9.....	312		19.....	384
	19.....	264		20.....	264
	20.....	216		21.....	240
	21.....	312		23.....	384
	23.....	120		24.....	144
	24.....	144		25.....	456
	26.....	312		27.....	432
June	3.....	96		30.....	216
	4.....	216	July	2.....	336
	5.....	384		3.....	240
	9.....	432		8.....	336
	10.....	360		9.....	264

STATEMENT—Continued.

Date.		No. of cubic yards excavated and removed.	Date.		No. of cubic yards excavated and removed.
1856.			1856.		
July.	10	432	Sept.	2	144
	15	336		3	360
	16	288		4	336
	17	144		6	384
	18	384		8	144
	19	144		11	720
	21	384		13	528
	22	384		15	288
	23	288		16	48
	24	384		19	240
	25	288		20	288
	30	240		26	528
	31	288	Oct.	1	408
Aug.	1	288		2	432
	4	288		6	384
	7	144		8	336
	15	288		9	384
	16	192		10	480
	19	432		18	144
	20	480		21	144
	21	336		22	432
	23	288		27	192
	26	384		28	240
	27	432	Nov.	1	240
	28	624		3	192
	30	528			

Total number of cubic yards excavated by dredging, and removed from Chicago bar, between the 22d of April and the 3d of November, 1856, 26,112.

The number of days elapsed between the beginning and ending of the above period, exclusive of Sunday, is..... 162

Number of days lost by unfavorable weather 56

Number of days lost in repairing machinery, &c... 25

Total lost..... 81

Number of actual working days as per the above tabular statement..... 81

Total elapsed time as above..... 162 days.

The number of days unfavorable for dredging, during the period that the dredge was employed in 1856, was about 15 per cent. less than during the period that it was so employed in 1854.

The summer of 1854 contained a greater number of calm days, causing the lake to be smooth, than the same season of either of the years

1855 or 1856 ; and the autumnal gales of 1856 were more severe than those of either of the two next preceding years.

The actual expense of working the United States steam dredge in excavating and removing the above mentioned twenty six thousand one hundred and twelve cubic yards from the Chicago bar, including all contingencies chargeable to the operation, was, \$4,829 $\frac{94}{100}$, or 18 $\frac{1}{2}$ cents per cubic yard, shown in detail as follows, viz :

Date.	No. of voucher.	To whom paid.	Amount.
<i>Second quarter of 1856.</i>			
-----	23	C. E. Selleck, for wood-----	\$56 25
-----	27	John C. Shaw, for wood-----	60 75
-----	30	John West, for mattress-----	4 00
-----	33	Hubbard & Robb, for rigging-----	176 02
-----	38	Pay-roll to May 15, 1856-----	247 62 $\frac{1}{2}$
-----	39	Hubbard & Robb-----	49 74
-----	41	Charles Scott, for printing-----	2 75
-----	42	C. H. Dyer & Co., for coal-----	60 00
-----	43	Thomas George, for pumps-----	5 40
-----	45	Pay-roll to May 31, 1856-----	36 47
-----	47	Hammill, Haight & Co., (so much thereof)-----	15 78
-----	48	John Clark & Son-----do-----do-----	7 70
-----	50	Pay-roll to May 31, 1836-----	258 26 $\frac{1}{2}$
-----	54	Hammill, Haight & Co-----	15 07
-----	56	Hubbard & Robb-----	13 35
-----	58	Pay-roll to June 14, 1856-----	175 48
-----	63	Pay-roll to June 21, 1856-----	196 47
-----	65	Peter Wager, mate of U. S. dredge-----	227 50
Oct. 1	-----	John Clark & Son, blacksmithing-----	19 76
July 16	-----	C. H. Dyer & Co., for coal-----	162 00
Aug. 18	-----	William Lurkins, for towing loaded scows-----	25 00
July 24	-----	do-----do-----do-----	55 00
July 28	-----	do-----do-----do-----	50 00
Aug. 4	-----	do-----do-----do-----	45 00
Sept. 30	-----	do-----do-----do-----	266 40
Nov. 3	-----	do-----do-----do-----	133 60
Aug. 18	-----	M. D. Rice, for water-barrel-----	3 00
Aug. 18	-----	Satterlee Cook & Co., for fire-buckets-----	3 00
Aug. 18	-----	Johnson, Farnsworth & Co., for cooking-stove, &c-----	24 55
<i>Third and fourth quarters of 1856.</i>			
Aug. 22	-----	C. F. & E. Lilly, for crockery-----	8 40
July 26	-----	Robert B. Robinson, for wood-----	112 50
July 30	-----	John Clark & Son, (so much thereof)-----	34 05
July 31	-----	Thomas George & Co-----	5 00
July 31	-----	Bailey & Mead, soap for cleaning machinery, &c-----	3 60
Aug. 4	-----	H. D. Bassett, for wood for fuel for dredge-boat-----	273 75
Aug. 8	-----	Thomas Manahan, mess furniture for the crew-----	10 70
Aug. 9	-----	Alfred Smith & Co., for coal-----	33 75
-----	-----	Pay-roll to July 12, 1856-----	287 54
-----	-----	Pay-roll (second) to July 12, 1856, (so much thereof)-----	133 25
-----	-----	Pay-roll to July 26, 1856, (so much thereof)-----	216 25
-----	-----	Pay-roll to Aug. 9, 1856-----do-----do-----	187 74
-----	-----	Pay-roll to Aug. 23, 1856-----do-----do-----	203 73
-----	-----	Pay-roll to Sept. 6, 1856-----do-----do-----	188 50

TABLE—Continued.

Date.	No. of voucher.	To whom paid.	Amount.
Third and fourth quarters of 1856—Continued.			
-----	-----	Pay-roll to Sept. 20, 1856, (so much thereof)-----	\$184 37½
-----	-----	Pay-roll to Oct. 11, 1856-----do-----do-----	241 63
-----	-----	Pay-roll to Nov. 1, 1856-----do-----do-----	205 75
-----	-----	Pay-roll to Nov. 18, 1856-----do-----do-----	103 50
		Total cost of excavating and removing 26,112 cubic yards.	<u>4,829 94</u>
		Then, $\frac{482,994}{26,112}$ cents = 18.497 cents per cubic yard; say 18½ cents per cubic yard.	

Of the above quantity, eight hundred and sixteen (816) cubic yards of this excavated material were warped out and dropped in 4½ to 5 fathoms depth of water in the lake, to the southward of the harbor entrance, from whence there was no danger of its being washed back by the lake seas. This quantity involved the fruits of only two days' dredging, namely, the 22d and the 23d of April, 1856.

Finding that the Illinois Central Railroad Company were purchasing earth, deliverable along the western shore of its large water basin, (see the accompanying map, marked "G No. 38,") for the purpose of forming a more extended foundation for further buildings, it occurred to me that, instead of wasting any more of our excavated material, it would be better to sell it to this company, and thus defray, as far as practicable, a portion of the expense of dredging the harbor.

I accordingly entered, on the 28th of April last, in behalf of the United States, into a contract with that company, as shown by the accompanying document, marked A 3. It was duly reported to the Bureau of Topographical Military Engineers, and met the approbation of the honorable the Secretary of War.—(See the accompanying document, marked A 4.)

The delivery into the company's water basin was commenced on the 29th of April, and was continued until the 3d of November, when the dredge-boat was laid up for the season.

The quantity delivered into this basin within this period was 25,296 cubic yards, which, at the contract price of 14 cents per cubic yard, yielded to the harbor fund the sum of..... \$3,541 44

Besides this, there were sold to Messrs. S. D. Goyler & Co., contractors for grading and paving the streets of the city of Chicago, 450 cubic yards, delivered into their own vessels laid alongside the United States dredge-boat for the purpose, (at times when our own scows were being warped or towed away with their own loads, and hence without at all interrupting that operation,) at 10 cents per cubic yard, amounting to 45 00

There were also sold, between the 27th of August and the 4th of September, to C. D. Spaid, for filling in his dock, four large canal scow loads of sand, which were taken in alongside the dredge-boat without any expense to us of warping it away, at \$5 per load, amounting to... \$20 00

Total proceeds of the sale of sand and earth excavated and removed from Chicago bar by the United States steam-dredge in 1856, and placed to the credit of the United States in my accounts rendered to the Third Auditor of the Treasury* 3,606 44

Actual expense of this dredging, as before stated..... 4,829 94

Net cost to the United States of this dredging (or \$4 83 cents per cubic yard)..... 1,223 50

The following was the effect and benefit to commerce from the dredging:

By the end of May vessels drawing as much as nine feet of water were enabled to enter and depart by the north channel, near to the north pier-head. A reference to map G No. 38 will show that, before the dredging was commenced, not more than seven feet could be carried over the bar by that channel.

By the end of July this direct channel had obtained a depth of ten (10) feet, for a width of full 250 feet, and the majority of vessels were enabled to pass through it; which fact was reported to the bureau on that day, (see A 14,) and sailing directions for entering and clearing the harbor were at the same time published in the newspapers for the information of navigators.—(See A 15.)

By the 15th of August there was a clear channel of full 12 feet anywhere over the bar between a line drawn N.E. by N. from the north pier-head and a line drawn N. 86° E., or E. $\frac{1}{4}$ N. from the light-house.

The least width of the channel, then, having that depth over the bar, was 225 feet; and for a width of 50 feet, still more to the southward, eleven feet could be carried over the bar. Vessels of the largest class navigating the lakes were at this period in the habit of using this direct channel.

By the 15th of September the channel, full 12 feet deep over the bar, extended over all the space included between a line drawn N.E. by N. from the north pier-head and a line drawn N. 87° 30' E. from the light-house. The least width of the channel having a depth of 12 feet over the bar was then 375 feet, and the width having not less than 11 feet water extended 50 feet still more to the southward. All this will be seen by reference to the accompanying map, marked G No. 43, on a scale of $\frac{1}{2400}$, or 200 feet to one inch.

This was the condition of the harbor during the equinoctial storms in the latter part of September, and also in the forepart of October;

* See the accompanying receipts in favor of the United States, marked A 5, A 6, A 7, A 8, A 9, A 10, A 11, A 12, and A 13.

and many human lives, and a vast amount of property, were saved during those violent storms by the effect of this dredged-out channel. It enabled vessels of the largest draught to run safely into the harbor, instead of being in imminent danger of being stranded and lost.

On the 12th, 13th, and 14th of October, there was a violent gale from the N.W. and N.N.W. These were head-winds for vessels wishing to enter the harbor, and they blew so violently that several vessels were lost off this harbor. The greatest violence of this storm was on the 14th of October. Its effect was to shoal the bar to 11 feet by the north channel, but this depth still admitted the largest vessels.

The precise state of the harbor and bar on the 14th of November is again shown, from minute surveys made at that date, by the accompanying map, marked G No. 44, on a scale of $\frac{1}{2400}$, or 200 feet to one inch.

The registry of the daily heights of the surface of Lake Michigan, from observation on the permanent tide-gauge upon the north pier-head, (see map G No. 38 for its position,) has been continued to the present time.

The results of these observations are shown in the accompanying table, marked A 16. It commences on the 29th of February, 1856, at which period the gauge was artificially loosed from its frozen bed, and was continued to the 15th of November following, and will be so continued until it shall be frozen fast by the winter temperature.

On the 5th of August last an application was made by the president of the Illinois Central Railroad Company to the Secretary of War for permission to make a second opening in the United States south pier of Chicago harbor, for the purpose of communicating from the river with a second ship basin, which the said company designed constructing adjacent to its extended depots.* The position proposed for this second basin will be found indicated upon the accompanying map, G No. 43. The subject was referred by the Topographical Bureau to this office, and was favorably reported upon in my communication (No. 159) of August 28, 1856, and received the approval of the War Department under the same limitations, restrictions, and conditions as were stipulated in the case of the opening granted to communicate with the said company's first ship basin.—(See the papers marked A 17, A 18, and A 19, hereto attached.)

Repair of Chicago Harbor Piers.

In my last annual report, the decayed and dilapidated condition of these piers was fully brought to the notice of the bureau.

In order to prevent breaches in some of the most decayed parts, from the failing of the timbers above the water surface, repairs were made during the past season at the following points in the north pier, viz:

1. A space of 40 feet in length, terminating at a point 300 feet above the second angle in that pier, where the timbers had given way to within half a foot of the water surface, was repaired with strong timbers sufficiently to prevent the sand from being blown into the

* See A 17.

river to the great injury of navigation, until the more permanent work in stone masonry, as recommended in my last annual report, can be adopted.

2. A second space, 120 feet in length, terminating at the aforesaid angle in the north pier, where the timbers had given way quite to the water surface, was repaired in like manner to the above. This, however, is a temporary remedy, which will serve, for a short time only, to prevent the channel of the river from being much injured by the blowing in of sand during the prevalence of strong northerly and easterly winds. The adjacent parts, both above and below, are so far gone by decay that this repaired portion cannot long retain its union with them.

3. A large rupture which had occurred from the decay of the pier-timbers, 150 feet below the aforesaid angle in the north pier, was repaired with oak timber, but the decayed portions, above and below, must soon become so weak as to lose their union with this piece of new patch-work.

4. An open joint and jog which had occurred in the north pier, a few feet below the position of the present beacon-light, was repaired, and the stone within the pier was adjusted. The force of the lake waves had thrown this stone out of position by piling it up against the south timbers of the pier. This effect has been seen wherever a breach has occurred in the timbers forming the lakeward face of the pier.

The balance of the appropriation now on hand, appertaining to this harbor, will, probably, have to be expended in like manner during the ensuing winter in order to prevent the sea and the sand, wafted by violent winds, from breaching the north pier at other points which are much decayed.

I cannot better present the true condition of the Chicago harbor piers, nor my views in regard to the best mode of repairing them, and thus saving the harbor from destruction, than by quoting from my annual report of last year, as follows, viz:

“I would now recommend that these piers be repaired by substituting stone masonry in lieu of the present decayed timber work, from a plane one foot below the low-water level of the lake surface to a height of five feet above that surface, making a total height of six feet of masonry.

“There are quarries in this vicinity, communicating with the city of Chicago by canal, which furnish an excellent compact blue limestone well suited for this purpose. A sufficient supply can be readily obtained for the face work, of stretchers and headers, that will dress to the dimensions of six feet by four feet, and twelve to fifteen inches thick. Such a block, if fifteen inches thick, would weigh 5,460 pounds, or 182 pounds per cubic foot.

“I would recommend that this masonry be laid in the manner shown, for the first or lower stratum, by the accompanying drawing, marked G No. 24.*

* NOTE.—A duplicate original of this drawing, made in this office, is now in the custody of the Superintendent of Public Printing, or of the Secretary of the Senate, at Washington, prepared specially for the use of the engraver. J. D. G.

“Here it will be seen that it is proposed to build up both the lake and the river faces with stone blocks, six feet by four feet, and twelve to fifteen inches thick, by laying them, in each stratum alternately, longitudinally and transversely of the direction of the piers; that is to say, by a regular alternation of stretchers and headers of like dimensions; these blocks to be dressed with the hammer with sufficient accuracy to insure fair bearings and close joints. The intermediate space between these face walls to be filled with stone as it comes, in sufficient large blocks, from the quarry, without any other dressing than such occasional hammering as may be necessary to insure good and safe bearings. The blocks, in each successive stratum or course, to be so laid as to overlap or break the joints in the preceding one. The course that will rest entirely below the water surface to be laid in hydraulic cement; the other, or superincumbent courses, to be laid in mortar composed of one barrel of common lime to two barrels of hydraulic lime and the usual proportion of sharp sand.

“The portion of the north pier which is so much decayed above the water surface as to require to be thus repaired in masonry, is that included between the point marked G, on sheet ‘G No. 22,’* being the first angle which occurs in that pier in proceeding from its western towards its eastern extremity, and the point marked L, which is the point where the lake shore is at this time, [December 31, 1855,] met by this pier. This distance, G L, is 1,510 feet. I call it here section 1 of the north pier.

“Section 2 extends eastward from L to M, a distance of 377 feet. Section 3 extends from the point M to the eastern extremity of the north pier-head, a distance of 144 feet. The timbers above water on sections 2 and 3 being generally sound, although ruptured in several places from the action of the lake waves, the overloading of the piers by placing heavy weights upon them, and the battering of vessels running unavoidably against the pier-head; it is proposed, for the present, to repair these two last mentioned sections with good oak timber. It will save expense, and these sections will then, probably, remain sound for several years to come.

“The timber work, above water, of the south pier, is all very much decayed. I recommended that this pier be repaired with stone masonry from its present eastern extremity to the eastern limit of the opening granted, under certain specified conditions,† to communicate with the basin of the Illinois Central Railroad Company. The length of this portion is 908 feet. It would not be advisable to incur any expense in repairing the remaining or western portion of this pier, as it must soon be entirely destroyed and a new south shoreline be given to this portion of Chicago river by the excavation to be made by the city authorities under the grant made by the act of Congress of July 21, 1852. See map G No. 17,‡ herewith submitted.”

*NOTE.—A copy of this map is in the custody of the Superintendent of Public Printing, or the Secretary of the Senate, at Washington, prepared in this office for the engraver.

J. D. G.

† See Senate (Executive) document No. 77, of the 34th Congress, 1st session, pages 56 to 60. See, also, a reprint of these conditions, contained in Part I of this volume, marked A 16.

‡ A copy of this map is now in the custody of the Superintendent of Public Printing, or the Secretary of the Senate, at Washington, for the purpose of being engraved.

J. D. G.

(See, also, pp. 77, 79, and p. 81, of the aforesaid printed document. See, also, paper D, of Doc. A 26, and Doc. A 28, of Part I of this volume.)

The remarks contained in the foregoing quotation are equally applicable to the present condition of, and requirements for, this harbor.

I must repeat the recommendation contained in my last annual report, that a first-class steam-dredge be procured for use, exclusively, in keeping Chicago harbor in condition for the constant easy access of vessels drawing full 12 feet of water by the direct entrance near the north pier-head.

For this object the sum of \$17,500 is introduced in the accompanying estimate, marked A 20, being the same as estimate A 17 in my last annual report. In support of this recommendation, I beg leave to refer to the remarks in my said report, to be found at page 25 of Senate (Executive) document No. 77, of the 34th Congress, 1st session, and also in Part I of this volume.

A reference to the accompanying maps, G No. 38, G No. 43, and G No. 44, will show that a bar is in progress of formation immediately to the east of the extremity of the south harbor pier, which, if not counteracted, will injure the harbor at the mouth of Chicago river to the west of the principal bar. This obstruction has been slowly forming ever since the construction of the Illinois Central Railroad Company's breakwater pier.—(See map G No. 43, herewith submitted.)

Having now assumed a decided character, it should be immediately checked. This, it is respectfully submitted, can only be done by prolonging the south pier 480 feet to the eastward, by the addition of 15 cribs, each 32 feet long, 20 feet wide, and 20 feet high from bottom to top, or 15 feet high from the bottom to the surface of the water.

It is proposed that these cribs shall be constructed in accordance with the drawings given in detail on the sheet marked G No. 20, now in the custody of the Superintendent of Public Printing, or the Secretary of the Senate, at Washington, for the use of the engraver.

An estimate, marked A 21, is herewith submitted, of the cost of this pier extension, amounting to.....	\$29,518 05
Which added to the last year's estimate, now renewed and herewith submitted, marked A 20, amounting to	144,932 69
Gives, as the amount now required to be appropriated for Chicago harbor.....	<u>174,450 74</u>

The work can all be accomplished in two years if appropriations be granted early in each season. I would therefore recommend that the above amount be divided into two equal appropriations of \$87,225 37 each.

Full statistical tables were presented with my last annual report, (see Part I of this volume,) showing the amount and value of the foreign and domestic commerce of the port of Chicago for the year

1855, by lake shipments, by the Illinois and Michigan canal, and by the numerous railroads concentrating here, as follows, viz :

Total value of IMPORTS, foreign and domestic, at Chicago, in the year 1855.....	\$196,660,064 66
Total value of EXPORTS, foreign and domestic, in 1855	212,953,021 88
Aggregate value of the imports and exports of Chicago in 1855.....	409,613,086 54

That is to say, four hundred and nine million six hundred and thirteen thousand and eighty-six dollars and fifty-four cents.

Those statistics were obtained at a labor and expense which it can scarcely be expected will be repeated more than once in two years.

I will, therefore, merely add that the commercial activity and enterprise of this port, and the vast agricultural production which is the parent of the former, are steadily increasing, together with a corresponding increase of the population. The claims upon the general government to keep this harbor in a good condition, both for military and commercial purposes, are set forth in full detail in my said last annual report, and I respectfully ask attention to them in relation to what is herein recommended.—See Senate (Executive) Doc. No. 77, of the 34th Congress, 1st Session, p. 34 to p. 40. See also Part I of this volume.

Although that document purports, by its running heading, to be an account of the “*Harbors, &c., in Wisconsin and Michigan,*” yet, by the omission to print Parts II and III of the report, there is no account of any harbor in Michigan contained therein. The whole report, as rendered, treated of the harbors in Wisconsin, Illinois, Indiana, and Michigan. The document, as far as it was printed, treats of the harbors in Wisconsin and Illinois only, and is therefore incomplete.*

The population of the city of Chicago exceeds at this time one hundred thousand inhabitants.

Documents accompanying Lieut. Col. J. D. Graham's report on Chicago harbor.—1856.

A 1.

NOTICE TO MARINERS.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, April 7, 1856.

1. A complete survey of the bar at the entrance to Chicago harbor has just been made under the direction of this office.

* NOTE.—The omission will be found supplied in Part II of this volume. J. D. G.

2. The following directions should be observed by vessels drawing as much as twelve (12) feet, in order to enter the harbor clear of the bar, viz:

3. Bring the liberty pole at the intersection of Michigan avenue and Washington street to bear due *west* by compass, and run on that course until the beacon-light on the end of the north pier bears N. by W.

4. Then keep on this course, by steering for the beacon-light, until the mouth of the river between the two piers bears W. $\frac{1}{4}$ N., and run in on that course.

5. Vessels drawing not more than eight (8) feet may avoid running so far south, and enter as follows, viz:

6. Bring the liberty pole to bear S. W. by W. $\frac{3}{4}$ W., and run on that course until the beacon-light on the north pier bears N. by W., then run as per paragraph 4 above.

A chart is being prepared for publication under the direction of this office, to aid more minutely in entering and clearing the harbor.

The dredging of a channel near the north pier-head will be commenced this week.

J. D. GRAHAM,
Lieut. Col., Sup'ng Eng'r of Lake Michigan Works.

A 2.

NOTICE TO MARINERS.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, May 27, 1856.

The progress of dredging a ship-channel through the bar of Chicago harbor entrance has been considerably interrupted by masters of vessels inadvertently running so close to the United States steam dredge and her mud-scows as to catch the warp-lines and carry them away. Much time is unavoidably lost in repairing and reanchoring these warp-lines. *All masters of vessels* are therefore *requested*, in entering and clearing the *harbor*, to give a clear berth of at least twenty (20) fathoms from the steam dredge, and as large a one as possible, say forty (40) fathoms, to the mud-scows. If this rule be regarded, we shall soon have a good ship-channel of twelve feet deep through the present bar.

J. D. GRAHAM,
Lieut. Col., Superintending Eng'r, &c., &c.

A 3.

Contract with the Illinois Central Railroad Company for supplying said company with the materials dredged from Chicago bar, at 14 cents per cubic yard.

This agreement, made this twenty-eighth day of April, one thousand eight hundred and fifty-six, between James D. Graham, lieutenant colonel, of the United States army, and superintending engineer of the United States harbor improvements of Lake Michigan, in behalf of the United States, of the first part, and Roswell B. Mason, chief engineer of the Illinois Central Railroad Company, in behalf of the said company, of Chicago, of the county of Cook and State of Illinois, of the second part, witnesseth:

That the said Lieutenant Colonel James D. Graham, superintending engineer of the United States harbor improvements on Lake Michigan, for and in consideration of the stipulation by the party of the second part hereinafter mentioned, agrees—

To deposit, or to cause to be deposited, in the basin of the Illinois Central Railroad Company, at Chicago, now being filled with earth, such quantity of the earth, sand, and soil which shall be dredged out by the United States steam dredge from Chicago bar and harbor, during the year eighteen hundred and fifty-six, as can be conveniently so deposited, due regard being had to the direction and force of the wind in warping the mud or sand-scows to said basin.

And the said Roswell B. Mason, chief engineer of the Illinois Central Railroad Company, in behalf of the said railroad company, of the second part, doth promise and agree—

To pay, on the fifteenth day of each month of the year 1856, in good and lawful money of the United States, the sum of fourteen cents per cubic yard, unto the said Lieutenant Colonel James D. Graham, to be by him placed to the credit of the United States for and on account of the improvement of the harbor of Chicago, for all the earth, sand or soil, to be counted by the number of scow loads that shall be so deposited, at the rate of twenty four cubic yards per scow load.

In witness whereof, the parties have hereunto affixed their hands and seals, at the City of Chicago, in Cook county, in the State of Illinois, this twenty-eighth day of April, one thousand eight hundred and fifty-six.

Done in triplicate, one of which having been fulfilled by the parties hereto, the other two to be considered as having also been fulfilled.

JAMES D. GRAHAM, [L. S.]

*Lieut. Colonel U. S. Army, Superintending Engineer, &c.,
on the part of the U. S.*

R. B. MASON, [L. S.]

Engineer for the Illinois Central Railroad Company.

Signed and sealed in presence of us—

J. R. MAYER.

ADOLPHUS M. HIRSH.

A 4.

Colonel Abert to Colonel Graham.—Contract with the Illinois Railroad Company approved by the War Department.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 20, 1856.

SIR: Your letter, No. 135, of the 9th May was duly received and submitted to the War Department, with the following bureau endorsement:

“No authority to make any such contract. It is, however, a good matter.

“J. J. ABERT,
“Colonel Corps Topographical Engineers.

“MAY 15, 1856.”

The letter has been returned with the following War Department endorsement, viz:

“Satisfactory.

“JEFFERSON DAVIS,
“Secretary of War.

“MAY 19, 1856.”

This endorsement is considered by the bureau as an approval of the contract; therefore its provisions will receive your attention.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Lieut. Col. J. D. GRAHAM,
Corps Topographical Engineers, Chicago, Illinois.

A 5.

The Illinois Central Railroad Company

To the United States,

DR.

On account of Chicago harbor improvement.

1856—May 15. To 25 scow loads, of 24 cubic yards each, =
600 cubic yards, of sand and mud, delivered into the basin
of said company between the 29th of April and the 15th of
May, inclusive, 1856, at 14 cents per cubic yard, as per
contract..... \$84 00

Received, at Chicago, Illinois, this 15th day of May, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of eighty-four dollars, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 6.

The Illinois Central Railroad Company
To the United States, DR.

On account of Chicago harbor improvement.

1856—June 15. To 143 scow loads, of 24 cubic yards each, =
3,432 cubic yards, of sand and mud, delivered into the
basin of said company between the 16th day of May and
the 15th day of June, inclusive, 1856, at 14 cents per cubic
yard, as per contract..... \$480 48

Received, at Chicago, Illinois, this 16th day of June, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of four hundred and eighty dollars and forty-eight cents, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 7.

The Illinois Central Railroad Company
To the United States, DR.

On account of Chicago harbor improvement.

1856—July 15. To 208 scow loads, of 24 cubic yards each, =
4,992 cubic yards, of sand and mud, delivered into the
basin of said company between the 16th of June and the
14th of July, inclusive, 1856, at 14 cents per cubic yard,
as per contract..... \$698 88

Received, at Chicago, Illinois, this 16th day of July, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of six hundred and ninety-eight dollars and eighty-eight cents, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 8.

The Illinois Central Railroad Company
To the United States,

DR.

On account of Chicago harbor improvement.

1856—August 15. To 190 scow loads, of 24 cubic yards each, = 4,560 cubic yards, of sand and mud, delivered into the basin of said company between the 15th of July and the 15th of August, inclusive, 1856, at 14 cents per cubic yard, as per contract..... \$638 40

Received, at Chicago, Illinois, this 16th day of August, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of six hundred and thirty-eight dollars and forty cents, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 9.

The Illinois Central Railroad Company
To the United States,

DR.

On account of Chicago harbor improvement.

1856—September 15. To 275 scow loads, of 24 cubic yards each, = 6,600 cubic yards, of sand and mud, delivered into the basin of said company between the 16th of August and the 15th of September, inclusive, 1856, at 14 cents per cubic yard, as per contract..... \$924 00

Received, at Chicago, Illinois, this 16th day of September, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of nine hundred and twenty-four dollars, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 10.

The Illinois Central Railroad Company
To the United States, DR.

On account of Chicago harbor improvement.

1856—October 15. To 147 scow loads, of 24 cubic yards each, = 3,528 cubic yards, of sand and mud, delivered into the basin of said company between the 16th of September and the 15th of October, inclusive, 1856, at 14 cents per cubic yard, as per contract..... \$493 92

Received, at Chicago, Illinois, this 17th day of October, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of four hundred and ninety-three dollars and ninety-two cents, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 11.

The Illinois Central Railroad Company
To the United States, DR.

On account of Chicago harbor improvement.

1856—November 14. To 66 scow loads, of 24 cubic yards each, = 1,584 cubic yards, of sand and mud, delivered into the basin of said company between the 16th of October and the 3d of November, inclusive, 1856, at 14 cents per cubic yard, as per contract..... \$221 76

Received, at Chicago, Illinois, this 14th day of November, 1856, of John B. Calhoun, assistant treasurer of the Illinois Central Railroad Company, the sum of two hundred and twenty-one dollars and seventy-six cents, to be placed to the credit of the United States fund for improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 12.

S. D. Goyler & Co.

To the United States,

DR.

On account of Chicago harbor improvement.

1856—August 4. To 6 canal boat loads, of 75 cubic yards each, = 450 cubic yards, of sand, delivered into the said canal boats, lying alongside of the United States steam dredge between the 29th day of July and the 1st day of August, 1856, at 10 cents per cubic yard..... \$45 00

Received, at Chicago, Illinois, this 5th day of August, 1856, of S. D. Goyler & Co., the sum of forty-five dollars, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 13.

C. D. Spaid

To the United States,

DR.

On account of Chicago harbor improvement.

1856—August 27.	To 1 scow load of sand, at \$5 per load....	\$5 00
“ 28.	To 1 scow load of sand, at \$5 per load....	5 00
Sept’ber 3.	To 1 scow load of sand, at \$5 per load....	5 00
“ 4.	To 1 scow load of sand, at \$5 per load....	5 00
		20 00

Received, at Chicago, Illinois, this 14th day of November, 1856, of Mr. C. D. Spaid, the sum of twenty dollars, to be placed to the credit of the United States fund for the improvement of Chicago harbor, and for which I am accountable to the treasury of the United States through the Third Auditor.

J. D. GRAHAM,
Lieut. Col., Sup. Engineer, &c.

A 14.

Col. Graham to Col. Abert, reporting the condition of Chicago harbor produced by dredging.

[No. 155.]

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, July 31, 1856.

SIR: I have the honor to report that the dredging on Chicago bar, done under the direction of this office since April last, has produced a

ship-channel ten feet deep and at least two hundred and fifty feet wide off the north pier-head. By this channel of direct entrance nearly all vessels now enter and depart from the port of Chicago, thus saving them the great expense of towage by steam-tugs, and insuring a ready and safe refuge from the dangers of the northerly and northeasterly storms which are so prevalent, and usually very destructive for want of harbors of refuge on this lake.

I enclose to you by this day's mail, under a separate envelope, three copies of my last chart, (G No 38,) showing, by dotted lines drawn in blue, the exact location of the channel which has been made of the capacity above mentioned. There is not time, with my present assistance, to construct a new map for this purpose. When the depth of twelve feet shall have been obtained, a new map, showing the then state of the harbor, will be projected from careful survey and forwarded to the bureau.

I append to this sheet the sailing directions which have been this day issued from this office, and published in the newspapers of this city, to aid mariners in benefitting by our newly-dredged channel.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Major of Top. Eng'rs, Bvt. Lieut. Col., Sup'ng Eng'r, &c.

A 15.

NOTICE TO MARINERS.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, July 31, 1856.

The dredging of the bar at the mouth of Chicago harbor has produced a ship-channel, by the direct entrance close to the north pier-head, of ten feet deep by two hundred and fifty feet wide.

Vessels drawing full ten feet may enter as follows, viz:

Bring the north pier-head to bear S. W. by W., and run for it until within one hundred feet or sixteen fathoms of it, taking care then to give it a berth of fifty feet, or say eight fathoms. So soon as the beacon-light on the north pier bears N. W., run into the river on a course W. by S.

Vessels may enter at night as follows, viz:

Bring the light-house (*not the beacon-light on the north pier*) to bear by compass W. $\frac{1}{2}$ S., and run on that course until the head of the south pier is passed. Then run up the river as usual.

If the wind be strong from the northward, then, in order to allow for lee-way and avoid the bar to the southward, run as follows, viz:

Bring the light-house to bear W. $\frac{3}{4}$ S. and run for it, keeping on that course until the north pier-head is passed twenty fathoms. Then run for the middle of the river as per the chart.

J. D. GRAHAM,

Lieut. Col., Superintending Engineer, &c.

A 16.

A register of the relative heights and fluctuations of the surface of Lake Michigan, from observations made under the direction of Lieutenant Colonel J. D. Graham, on a permanent tide-gauge, fixed at the east extremity of the United States north pier of Chicago harbor, between January 1, 1856, and November 17, 1856.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856.					
Jan. 1	12 noon.	Frozen	Southwest.	Light breeze.	Snow six inches deep.....
2	do	do	do	do	Clear day.....
3	do	do	West	Fresh breeze.	Clear and cold.....
4	do	do	South	Light breeze.	Thermometer (Fahrenheit) 8° below zero, exposed at McCormack's reaper factory, at eight o'clock, a. m.
5	do	do	West	do	Thermometer 16° below zero....
6	do	do	South	do	Thermometer 18° below zero....
7	do	do	West	Fresh breeze.	Thermometer 22° below zero....
8	do	do	do	do	Thermometer 24° below zero....
9	do	do	Southwest.	Light breeze.	Thermometer 30° below zero....
10	do	do	West	do	Thermometer 24° below zero....
11	do	do	South	do	Thermometer 18° below zero....
12	do	do	do	do	Weather moderating.....
13	do	do	West	do	Snowing.....
14	do	do	Northwest	do	do.....
15	do	do	do	Fresh breeze.	.....
16	do	do	West	do	.....
17	do	do	South	Light breeze.	Clear and pleasant.....
18	do	do	Southwest.	do	By observation of the ice at mouth of river, there has been very little variation in the tide for the last 20 days; ice piled up in the lake at north pier-head 10 feet high.
19	do	do	North	Fresh breeze.	Lake rough; water visible at the mouth of the river.
20	do	do	Northeast.	Strong	Snow-storm from the northeast..
21	do	do	North	Light breeze.	Snow 8 inches deep; clear and cold.
22	do	do	West	do	Lake quiet.....
23	do	do	Southwest.	do	2 p. m. schooner Charlotte left from the mouth of the river for Sheboygan, Wisconsin.
24	do	do	North	do	Clear and cold.....
25	do	do	Northeast.	do	Cloudy.....
26	do	do	East	do	do.....
27	do	do	do	Strong	Snow 12 inches deep; snow-storm from the east.
28	do	do	Southwest.	Light breeze.	Clear and cold.....
29	do	do	West	Fresh breeze.	do do.....

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856.					
Jan. 30	12 noon.	Frozen	Southwest.	Fresh breeze.	Clear and very cold.
31	do.	do.	South	Light breeze.	Weather moderating; lake quiet; the pier has been carefully watched; no damage has been done by the ice more than ordinary wear and tear, since the ice was blocked up fast and immovable.
Feb. 1	do.	do.	West	do.	Snow 12 inches deep.
2	do.	do.	do.	do.	do do
3	do.	do.	Northwest	do.	do do
4	do.	do.	Southwest.	do.	do do
5	do.	do.	West	do.	do do
6	do.	do.	Southeast.	Fresh breeze.	Snow-storm from the southeast.
7	do.	do.	West	Light breeze.	Snow 15 inches deep.
8	do.	do.	Southwest.	do.	do do
9	do.	do.	South	do.	do do
10	do.	do.	do.	do.	do do
11	do.	do.	Northwest	do.	do do
12	do.	do.	do.	do.	do do
13	do.	do.	do.	do.	do do
14	do.	do.	South	do.	do do
15	do.	do.	West	do.	do do
16	do.	do.	do.	do.	do do
17	do.	do.	Southwest.	Fresh breeze.	do do
18	do.	do.	North	Light breeze.	do do
19	do.	do.	South	do.	do do
20	do.	do.	West	do.	Weather moderating.
21	do.	do.	South	Fresh breeze.	do do
22	do.	do.	do.	Light breeze.	do do
23	do.	do.	North	Fresh breeze.	It commenced raining last evening about dark, the first rain which has fallen here for more than two months.
24	do.	do.	West	Light breeze.	Weather moderating.
25	do.	do.	Southwest.	Fresh breeze.	Cold
26	do.	do.	East	Light breeze.	Weather moderating.
27	do.	do.	North	Fresh breeze.	Cold
28	do.	do.	Northwest	Light breeze.	Weather moderating.
29	do.	2.40	West	do.	The tide-gauge thawed loose.
March 1	do.	2.55	Northeast	do.	Cold.
2	do.	2.45	Southwest	do.	do
3	do.	2.30	South	Fresh breeze.	do
4	do.	Frozen	West	do.	do
5	do.	1.65	South	do.	do
6	do.	2.20	West	do.	do
7	do.	2.55	Southwest	do.	do
8	do.	2.70	Northeast	Light breeze.	Snow
9	do.	Frozen	East	Fresh breeze.	
10	do.	do.	West	do.	
11	do.	do.	North	Light breeze.	
12	do.	1.95	Southwest	do.	Weather moderating.

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856.					
Mar. 13	12 noon	2.30	South	Light breeze.	
14	do	2.25	Southwest	Fresh breeze.	
15	do	2.15	West	Light breeze.	
16	do	2.20	South	do	
17	do	2.30	East	do	
18	do	2.35	do	do	
19	do	2.30	Southeast	do	
20	do	2.25	West	do	
21	do	2.50	North	do	
22	do	2.45	do	do	The first rain to-day since the 23d of February.
23	do	2.20	West	do	River open as far as the ferry; mouth of the harbor clear of ice.
24	do	2.30	Northwest	do	The river continues closed by ice above the ferry. Schooner Liberty arrived from Racine, Wisconsin.
25	do	2.35	Northeast	do	River open above the ferry.
26	do	2.15	North	do	Schooner Liberty left for Racine, and the steamer Huron for Milwaukee. At 6 p. m. ice broken up in the river and floating out in the lake.
27	do	2.30	do	Fresh breeze.	
28	do	2.10	Northeast	do	Weather moderating.
29	do	2.15	East	do	Steamer Huron arrived from Milwaukee.
30	do	2.55	Northeast	do	The Huron left again for Milwaukee.
31	do	2.35	do	Light breeze.	Weather clear and pleasant.
April 1	do	2.20	Southeast	do	Two schooners left in the evening. At 7 p. m. raining.
2	do	2.10	Southwest	Fresh breeze.	Navigation considered entirely open. Five schooners left.
3	do	2.40	West	Light breeze.	Raining. One propeller and two schooners left.
4	do	2.50	North	Fresh breeze.	Weather pleasant.
5	do	2.30	East	Light breeze.	Vessels leaving daily since the 2d instant.
6	do	2.50	Southeast	do	do do
7	do	2.40	East	do	do do
8	do	2.10	Southeast	Fresh breeze.	do do
9	do	2.45	West	do	do do
10	do	2.15	Northeast	Light breeze.	Vessels arriving and departing daily.
11	do	2.40	South	Fresh breeze.	Raining
12	do	2.85	North	do	Weather cool and stormy.
13	do	2.50	Northeast	Light breeze.	Weather clear and pleasant.
14	do	2.30	East	Fresh breeze.	Raining
15	do	2.30	South	do	Weather clear and pleasant.
16	do	2.40	Southwest	Light breeze.	do do
17	do	2.10	West	do	do do

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856.					
April 18	12 noon	2. 40	West.	Light breeze.	Weather clear and pleasant.
19	do	3. 00	North	Fresh breeze.	.....
20	do	2. 75	do	Light breeze.	.....
21	do	2. 50	do	do	.....
22	do	2. 20	South	do	.....
23	do	2. 40	Northeast	do	.....
24	do	2. 45	North	do	.....
25	do	2. 30	East	do	.....
26	do	2. 45	South	Fresh breeze.	.....
27	do	2. 20	do	do	.....
28	do	2. 25	Southwest	Light breeze.	.....
29	do	2. 45	Northeast	do	.....
30	do	3. 20	East	Fresh breeze.	Rainy
May 1	do	2. 90	South	Light breeze.	Weather pleasant
2	do	3. 00	West.	do	Cloudy
3	do	2. 90	North.	do	do
4	do	3. 20	Northeast	Fresh breeze.	Clear and cool
5	do	3. 00	do	do	Cloudy and cool
6	do	3. 15	do	do	do
7	do	2. 90	do	do	Raining
8	do	2. 75	North.	Light breeze.	Clear and pleasant
9	do	2. 60	East.	do	do
10	do	2. 45	Southeast.	do	do
11	do	2. 55	West.	do	do
12	do	3. 00	North.	Fresh breeze.	do
13	do	3. 05	East.	do	Raining
14	do	2. 70	Southwest	Light breeze.	Cloudy
15	do	2. 60	West.	do	Clear and pleasant
16	do	3. 80	North.	Fresh breeze	Cool
17	do	2. 70	do	do	Raining
18	do	2. 85	do	Light breeze.	Clear and pleasant
19	do	2. 70	West.	do	.....
20	do	2. 85	North.	do	.....
21	do	3. 10	Northeast.	do	.....
22	do	2. 55	Southeast.	do	.....
23	do	2. 50	South	do	.....
24	do	2. 80	North	do	.....
25	do	2. 75	do	do	.....
26	do	2. 60	Southwest	do	.....
27	do	2. 75	Northwest	Fresh breeze.	Cloudy
28	do	3. 05	Northeast	Light breeze.	Clear and pleasant
29	do	2. 90	North.	do	.....
30	do	2. 75	Northeast.	do	Clear and pleasant.
31	do	2. 45	Southwest	Fresh breeze.	Cloudy
June 1	do	2. 50	South	Light breeze.	.....
2	do	2. 80	do	do	.....
3	do	3. 20	Southwest	do	.....
4	do	2. 40	West.	do	.....
5	do	2. 65	East.	do	.....
6	do	3. 15	do	do	.....
7	do	2. 95	West.	do	.....
8	do	3. 00	North.	do	.....

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856.					
June 9	12 noon	2.85	Northeast	Light breeze.	
10	--do--	2.75	East.	do.	
11	--do--	2.70	South.	do.	
12	--do--	2.35	West.	Fresh breeze.	
13	--do--	2.75	do.	Light breeze.	
14	--do--	2.70	do.	do.	
15	--do--	2.85	Northeast	do.	
16	--do--	2.75	Southeast.	do.	
17	--do--	2.80	Southwest	do.	
18	--do--	2.85	North.	do.	
19	--do--	2.85	Southeast.	do.	
20	--do--	2.80	do.	do.	
21	--do--	2.75	Southwest	Fresh breeze.	
22	--do--	2.85	South.	Light breeze.	
23	--do--	3.00	Southeast.	do.	
24	--do--	2.85	Southwest	do.	
25	--do--	2.95	Southeast.	do.	
26	--do--	2.55	South.	Fresh breeze.	
27	--do--	2.80	East.	Light breeze.	
28	--do--	2.65	Southwest	Fresh breeze.	
29	--do--	2.40	do.	Light breeze.	
30	--do--	2.80	East.	do.	
July 1	--do--	3.00	Northeast.	do.	
2	--do--	3.00	South.	do.	
3	--do--	2.55	Southwest.	do.	
4	--do--	3.00	North.	Fresh breeze.	
5	--do--	2.81	Southwest.	Light breeze.	
6	--do--	2.95	Northeast.	Fresh breeze.	
7	--do--	3.15	do.	do.	
8	--do--	3.10	North.	Light breeze.	
9	10 a. m.	3.00	Southeast.	Calm.	Wind changed to NE. at 2 p. m.
10	--do--	3.10	East.	Light breeze.	
11	--do--	3.15	Southeast.	Fresh breeze.	Heavy rain and thunder at 2 p. m.
12	--do--	2.90	West.	Stiff breeze.	Showery and cold.
13	--do--	2.85	Southwest	Light breeze.	Clear and calm in the afternoon.
14	--do--	2.65	Southeast.	do.	Variable and cloudy.
15	--do--	3.00	do.	do.	Clear.
16	--do--	2.80	South.	do.	do.
17	--do--	2.76	West.	do.	Changeable.
18	--do--	2.46	WNW.	Fresh breeze.	Clear.
19	--do--	2.75	Northwest	do.	do.
20	--do--	3.00	Northeast	Light breeze.	do.
21	--do--	2.80	Southeast.	Calm.	do.
22	--do--	2.70	East.	do.	Clear; afternoon cloudy.
23	--do--	2.75	do.	Light breeze.	Clear.
24	--do--	2.80	do.	do.	do.
25	--do--	2.81	South.	Fresh breeze.	do.
26	--do--	2.67	Southwest.	do.	Cloudy; strong west wind at 5 p. m., with rain.
27	--do--	2.88	do.	Light breeze.	Heavy rain at 6 p. m.
28	--do--	2.80	do.	Fresh breeze.	Cloudy, with showers.
29	--do--	2.85	West.	do.	Clear.

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856.					
July 30	10 a. m.	2. 20	Southwest.	Light breeze.	Clear.....
31	do	2. 88	do	do	do.....
Aug. 1	do	2. 60	South	Fresh breeze.	do.....
2	do	2. 65	Southwest.	do	Rain.....
3	do	2. 62	Southeast.	Light breeze.	Clear.....
4	do	2. 60	Northwest	do	do.....
5	do	3. 00	Northeast.	do	Fair.....
6	do	2. 70	East.....	do	Cloudy.....
7	do	2. 75	Northeast.	do	Clear.....
8	do	2. 73	do	do	do.....
9	do	2. 55	do	do	do.....
10	do	2. 50	Southwest.	do	Cloudy.....
11	do	2. 38	Southeast.	do	Clear.....
12	do	2. 45	Northeast	do	do.....
13	do	2. 58	Northwest	do	Cloudy in p. m.
14	do	2. 63	Southeast.	do	Clear.....
15	do	2. 72	East.....	Fresh breeze.	do.....
16	do	2. 68	do	Light breeze.	do.....
17	do	2. 75	Southwest.	do	Showery.....
18	do	2. 70	Southeast.	do	Rain.....
19	do	2. 60	ENE.....	do	Cloudy.....
20	do	2. 65	Northeast	Fresh breeze.	do.....
21	do	2. 50	Southeast.	Light breeze.	Clear.....
22	do	2. 53	South	Fresh breeze.	do.....
23	do	2. 67	Northwest	Light breeze.	do.....
24	do	2. 60	do	Fresh breeze.	Cloudy.....
25	do	3. 30	Northeast	Strong breeze	The schooner Arrow went ashore on the beach north of the north pier.
26	do	2. 80	East.....	Mod. breeze.	Clear.....
27	do	2. 45	West.....	Fresh breeze.	do.....
28	do	2. 73	Southwest.	Light breeze.	Cloudy.....
29	do	2. 90	Northeast	Fresh breeze.	Clear.....
30	do	2. 48	West.....	Light breeze.	do.....
31	do	2. 52	Northeast	do	do.....
Sept. 1	do	3. 00	Southwest.	Fresh breeze.	do.....
2	do	3. 10	Northeast.	Light breeze.	do.....
3	do	2. 40	East	do	do.....
4	do	2. 38	Southwest.	Fresh breeze.	Showery.....
5	do	2. 41	Southeast.	do	Very heavy rain.
6	do	2. 90	do	do	Heavy rain p. m.
7	do	3. 00	Southwest.	do	Clear.....
8	do	3. 05	do	Light breeze.	do.....
9	do	2. 82	Southeast.	Fresh breeze.	do.....
10	do	2. 90	South	do	Rain.....
11	do	3. 00	Southwest.	Light breeze.	Clear.....
12	do	3. 05	do	Fresh breeze.	Rain.....
13	do	2. 95	do	do	Clear.....
14	do	2. 85	Northwest	Light breeze.	do.....
15	do	2. 71	Northeast.	Fresh breeze.	do.....
16	do	2. 90	ENE.....	Mod. breeze.	do.....

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856. Sept. 17	10 a. m.	2. 22	Southwest.	Fresh breeze.	Showery during the day ; at 1 p. m. register read 3.50 ; at 2.10 o'clock, 2.10 ; at 3.25 o'clock, 3.70 ; high wind during the night.
18	--do----	1. 40	West-----	Strong breeze	Cloudy-----
19	--do----	1. 60	-----do----	Fresh breeze.	Ferryboat upset-----
20	--do----	2. 00	Northwest	Mod. breeze.	Clear-----
21	--do----	2. 40	-----do----	Strong breeze	--do-----
22	--do----	2. 75	-----do----	-----do----	Cloudy-----
23	--do----	2. 83	NW by W.	Fresh breeze.	--do-----
24	--do----	2. 55	West-----	-----do----	Clear-----
25	--do----	1. 60	Southwest.	Strong breeze	Cloudy-----
26	--do----	2. 47	West-----	Light breeze.	Clear-----
27	--do----	2. 15	Southwest.	Fresh breeze.	--do-----
28	--do----	2. 10	South-----	Light breeze.	Cloudy-----
29	--do----	2. 12	Northwest	-----do----	Clear-----
30	--do----	2. 20	-----do----	Fresh breeze.	Cloudy, and snow fell in small quantities.
Oct. 1	--do----	2. 10	West-----	Light breeze.	Clear-----
2	--do----	1. 70	-----do----	-----do----	--do-----
3	--do----	2. 25	Southwest.	Fresh breeze.	--do-----
4	--do----	2. 58	South-----	Light breeze.	Cloudy p. m-----
5	--do----	1. 80	Southwest.	-----do----	Cloudy, with very heavy rain and thunder at 2 o'clock, p. m.
6	--do----	1. 41	Northeast--	-----do----	Foggy-----
7	--do----	2. 35	Southeast--	-----do----	Clear-----
8	--do----	2. 33	-----do----	-----do----	--do-----
9	--do----	2. 45	Southwest.	-----do----	--do-----
10	--do----	2. 43	-----do----	-----do----	--do-----
11	--do----	2. 46	NW by N--	Fresh breeze.	Cloudy-----
12	--do----	2. 70	Northwest	-----do----	Heavy blow and showery-----
13	--do----	3. 00	-----do----	-----do----	--do-----do-----
14	--do----	3. 76	NNW-----	Strong breeze	Heavy blow ; several vessels went ashore ; the schooner A. R. Cobb struck the Illinois Central Railroad Company's protection pier and was lost, also her cargo of lumber.
15	--do----	2. 45	North-----	-----do----	Foggy-----
16	--do----	2. 37	Northwest	Light breeze.	--do-----
17	--do----	2. 34	-----do----	-----do----	--do-----
18	--do----	2. 32	East-----	Mod. breeze.	--do-----
19	--do----	2. 50	West-----	Light breeze.	Clear-----
20	--do----	2. 48	South-----	-----do----	Cloudy-----
21	--do----	2. 35	Southeast--	-----do----	Clear-----
22	--do----	2. 13	WNW-----	-----do----	--do-----
23	--do----	3. 78	Northwest	Strong breeze	Heavy blow ; several vessels ashore ; register at 8 a. m. reads 3.50 ; at 9 a. m. reads 2.92 ; at 1 p. m. reads 2.40 ; at 5 p. m. reads 2.79.

A 16—Continued.

Date.	Time of observation.	Surface of lake, per tide-gauge, in feet and decimals.	Wind.		Remarks.
			Course.	Strength.	
1856. Oct. 24	10 a. m.	3. 70	Northeast.	Strong breeze	Rainy; register reads at 12 m. 3.35; at 3 p. m. reads 3.60; at 4 p. m. reads 3.75.
25	do	2. 56	West	Light breeze.	Clear
26	do	2. 28	Southeast.	Fresh breeze.	Cloudy
27	do	1. 97	Southwest.	Light breeze.	Clear
28	do	1. 80	do	do	do
29	do	1. 49	WSW	Fresh breeze.	Cloudy
30	do	1. 41	WNW	do	Snow
31	do	1. 38	Southwest.	Light breeze.	Clear
Nov. 1	do	1. 85	West	Fresh breeze.	do
2	do	1. 80	Southeast.	Light breeze.	Foggy and rain
3	do	2. 58	Northeast.	Strong breeze	Heavy blow and snow in p. m.
4	do	3. 21	ENE	Fresh breeze.	Clear
5	do	3. 18	Southwest.	Light breeze.	do
6	do	1. 27	South	Strong breeze	Heavy blow; 3 vessels sunk alongside of the north pier; register reads at 1 p. m. 1.10; at 4.15 p. m. 1.18.
7	do	1. 72	do	Fresh breeze.	Rainy
8	do	1. 98	Southwest.	do	Snow
9	do	2. 20	South	do	Clear
10	do	2. 10	SW by S	Light breeze.	do
11	do	2. 38	West	Calm	do
12	do	2. 22	do	do	do
13	do	2. 18	do	do	do
14	do	2. 22	do	do	do
15	do	1. 97	South	Light breeze.	do
16	do	2. 00	West	Fresh breeze.	Snow
17	do	2. 05	Northwest	Light breeze.	Cloudy

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, November 17, 1856.

A 17.

Application of the President of the Illinois Central Railroad Company for the permission of the War Department to make a second opening in the United States south pier of Chicago harbor, to communicate with their second ship basin.

OFFICE OF THE ILLINOIS CENTRAL RAILROAD COMPANY,
Chicago, August 5, 1856.

SIR: A basin extending through the government pier, similar to the one already opened by your permission, would be of great service to this company, and is required to accommodate the rapidly increasing commercial interests of this city. This improvement will, we think, in no way impair the objects of the general government in the construction of the pier; for the buildings which will be erected at an early day, outside of this basin, must be placed upon solid foundations, thus forming, without further expense to the government, a permanent protection to the river, which was the object of the original pier.

Upon application to Colonel Graham, he has referred me to the War Department, and it will be esteemed a favor if you will, at your convenience, request Colonel Graham's report upon the subject, for the approach of autumn renders it indispensable to take immediate measures to accomplish this improvement, if it is not deemed inconsistent with the interests of the United States.

I have the honor to be, sir, your most obedient servant,

W. H. OSBORN,

President Illinois Central Railroad Company.

Hon. JEFFERSON DAVIS,

Secretary of War, Washington.

A 18.

Colonel Graham to Colonel Abert, on the subject of the preceding letter.

[No. 159.]

OFFICE GENERAL SUPERINTENDENCE
OF LAKE MICHIGAN WORKS,
August 28, 1856.

SIR: I have the honor to acknowledge your reference to this office of the application made to the War Department on the 5th instant, by the president of the Illinois Central Railroad Company, at Chicago, to be permitted to make another opening in the United States south pier at Chicago harbor, in order to admit the passage of vessels to and from a second slip, or basin, which the said company propose to construct just below and to the east of their present basin, whose position will be seen marked on sheet G No. 38, being a chart of Chicago harbor and bar from surveys made in April last, now on file in the Topographical Bureau.

The hydraulic principles which apply to this case, as tending to affect the character of the river for navigation, are precisely the same as those set forth in my report No. 34 to the bureau, of the 4th of September, 1854, (being the paper marked A 15 in the printed Senate Executive document No. 77, of the 34th Congress, 1st session,* pages 49 to 51.)

I am satisfied that no injury can arise to the channel of the river, or to the harbor, by granting the request of the company in the present case, *provided* it be on and in compliance with the same conditions and limitations which were specified and agreed to in the case of the first opening. These conditions and limitations, and the penal bond of the company in that case, will be found in the paper marked A 16, in the above mentioned printed document No. 77, at pages 56 to 60.†

I would respectfully recommend that the application of the company of the 5th instant be granted upon the same conditions throughout, and upon their executing a like bond to the United States.

Such slips, or ship basins, if carefully planned, so as not to impair the navigation of the river nor the entrance of the harbor, will prove great aids to the general commerce of the port of Chicago.

I herewith respectfully return the letter of W. H. Osborn, esq., president of the Illinois Central Railroad Company, addressed to the honorable the Secretary of War on the 5th instant.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj. Top. Eng's, Bvt. Lieut. Col., Sup'g Eng., &c., &c., &c.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

[Endorsement of the Secretary of War on the above letter.]

“Recommendation approved.

“JEFF'N DAVIS,

“*Secretary of War.*

“WAR DEPARTMENT,

“*September 11, 1856.*”

A 19.

BUREAU OF TOPOGRAPHICAL ENGINEERS,

Washington, September 2, 1856.

SIR: The application of W. H. Osborn, esq., of the 5th August, having been referred to Lieutenant Colonel Graham, stationed at Chicago, for his opinion, in a letter from him of the 28th of August, he

* This paper is also found, marked A 15, in Part I of this volume.

J. D. G.

† They will also be found in the paper marked A 16, in Part I of this volume.

says: "I would respectfully recommend that the application of the company, of the 5th instant, be granted upon the same conditions throughout," (as a previous similar application, referred to in the letter of Lieutenant Colonel Graham,) "and upon their execution of a like bond to the United States."

It is accordingly recommended that said application be granted, according to the suggestions of Lieutenant Colonel Graham, and that he be directed to attend to it.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Col. Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

[Endorsement on the above by the Secretary of War.]

"Recommendation approved.

"JEFFERSON DAVIS,
"Secretary of War.

"WAR DEPARTMENT,
"September 11, 1856."

A 20.

Estimate of funds required for the repairs of the United States piers at Chicago harbor, Illinois, and for the improvement of said harbor, for the fiscal year ending June 30, 1857.

1. For the repairs required to be done in stone masonry :	
This includes the first section of the north pier, from G to L, (see map G No. 22,) a length of.....	1,510 feet.
The south pier, from its east extremity to the ship basin of the Illinois Central Railroad Company, (see the same map).....	908 "
Total length to be repaired in stone masonry.....	<u>2,418 "</u>

The estimate for 100 feet in length, by 20 feet wide and 6 feet high, as per the horizontal and vertical sections shown in the drawing, marked "sheet G No. 24," will be as follows :

For 6,200 cubic feet of large stones, for stretchers and headers, at 30 cents per cubic foot.....	\$1,860 00
For rough-dressing stone and drilling dowel holes, at 5 cents per cubic foot.....	310 00
For 335 dowel pins, each 6 inches long of 1½ inch round, wrought-iron, at 15 cents each.....	50 25

For 60 barrels of hydraulic cement, at \$1 75 per barrel	\$105 00
For 20 loads of sand, (including hauling,) at 35 cents per load	7 00
For wages of masons and laborers in setting stretchers and headers, at 15 cents per cubic foot.....	930 00
For 5,600 cubic feet of rough quarry stone to place between the two face walls, at 5 cents per cubic foot.....	280 00
For 112 barrels hydraulic cement, at \$1 75 per barrel...	196 00
For 56 barrels common lime, at \$1.....	56 00
For 112 loads of sand, and hauling, at 35 cents.....	39 20
For wages of masons and laborers in setting rough quarry stone, at 5 cents per cubic foot.....	280 00
Sum	4,113 45
Add 10 per cent. for contingencies.....	411 35
For tearing away and removing decayed wood-work and boulder stone, at \$2 50 per lineal foot.....	250 00
Estimated expense for 100 feet.....	4,774 80
Then, 2,418 feet of north and south piers, at \$4,774 80 per hundred feet	\$115,454 66

2. For the repair of the second section of the north pier with white oak timber :

Length of section extending from L to M, (see map G No. 22,) equal to 377 feet :

For 10 cross-ties of white oak, each 24 feet long and 1 foot square, equal to 240 cubic feet, at 20 cents per cubic foot	\$48 00
For 30 pieces of white oak plank for flooring, each 24 feet long and 12 by 3 inches, equal to 2,160 feet, board measure, at \$22 per M.....	47 50
For 40 wrought-iron bolts, each 30 inches, and 1 inch square, equal to 338 pounds, at 4 cents per pound.....	13 52
For 180 wrought-iron spikes, each 6 inches long, and $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, being 6 to each plank, equal to 36 pounds, at $7\frac{1}{2}$ cents per pound.....	2 70
For superintendence and workmanship.....	50 00
For tearing off and removing decayed or broken timbers, and removing and then putting back boulder stone....	50 00
Sum	211 72
Add 10 per cent. for contingencies.....	21 17
Amount required for the second section.....	232 89

3. For the repair of the third section of the north pier :

Length of section 144 feet, terminating at the east face of the north pier-head.

For 80 piles of white oak, each 50 feet long and 1 foot square, equal to 4,000 cubic feet, at 25 cents for this length.....	\$1,000 00
For 3 sills of white oak for capping piles, each $26\frac{2}{3}$ feet long and 1 foot square, equal to 80 cubic feet, at 20 cents	16 00
For 16 cross-ties for uniting piling with the faces of the pier-head, of white-oak, each 12 feet long and 1 foot square, equal to 192 cubic feet, at 20 cents.....	38 40
For 112 wrought-iron bolts, each 30 inches long and 1 inch square, equal to $964\frac{1}{2}$ lbs., at 4 cents per lb.....	37 86
For workmanship on the above.....	460 00

For repairing ruptured joint at the west shoulder of the north pier-head.

For 6 pieces of white oak timber, each 30 feet long and 1 foot square, for the repairs of longitudinal walls, equal to 180 cubic feet, at 20 cents.....	36 00
For 6 cross-ties of white oak, each 24 feet long and 1 foot square, equal to 144 cubic feet, at 20 cents.....	28 80
For 2 braces of white oak, each 10 feet long, and 2 braces of white oak, each 15 feet long and 1 foot square, equal to 50 cubic feet, at 20 cents.....	10 00
For 32 bolts of wrought-iron, each 30 inches long, of 1 inch square, equal to $270\frac{1}{2}$ pounds, at 4 cents per pound	10 80
For workmanship and superintendence.....	120 00
Sum.....	1,757 86
Add 10 per cent. for contingencies.....	175 78
Amount required for the third section.....	<u>1,933 64</u>

4. For machinery, office rent, fuel for the same, stationery, and pay of three assistants to perform the duties of draughtsmen, and of copying official letters, &c., in the office of the superintending engineer, and for commutation for, or supplying in kind, fuel and quarters for the superintending engineer :

For a one-horse power pile-driver, resting on a substantial floating hull.....	\$800 00
For 2 derricks and cranes for lifting heavy blocks of stone, and appurtenances, at \$300 each.....	600 00
For 2 stone scows, at \$280 each.....	560 00
For the rent of office for the superintending engineer and his assistants and draughtsmen, one year.....	600 00
For fuel for the same for one year.....	150 00

For commutation for 4 rooms and fuel for superintending engineer for one year: quarters \$480, fuel \$250; total for one year.....	\$730 00
For stationery, drawing-paper, &c.....	120 00
For a survey of Chicago harbor, based on a triangulation.....	350 00
For pay of 3 assistants in office of superintending engineer, to perform the duties of draughtsmen, surveyors of harbor, copying official letters, making out accounts, &c., at 960 each.....	2,880 00
For transportation.....	100 00
Sum.....	6,890 00
Add 10 per cent. for contingencies.....	689 00
Fourth head—Amount required.....	7,579 00

5. For a steam dredge-boat for Chicago harbor :

Dimensions.

Length of keel.....	110 feet.
Breadth of beam.....	25 “
Depth of hold.....	7½ “
Length on deck.....	125 “
Greatest breadth on deck.....	40 “

Cost of building and rigging.

Hull, 217 tons, at \$35 per ton.....	\$7,595 00
Windlass, capstan, chocks, &c.....	150 00
Carriage frames and wheel-houses.....	200 00
Engine room and upper cabin.....	470 00
2 engines and 2 boilers, of forty-horse power each, with cylinders of 12 inches bore and 28 inches stroke.....	3,500 00
26 dredging buckets, (13 on each side,) at \$50 each.....	1,300 00
Bucket chains.....	500 00
Journals and boxes.....	150 00
2 paddle-wheels for locomotion.....	300 00
Iron castings for shafts, horn-flange, and cog and driving-wheels, 10,000 pounds, at 5 cent per pound...	500 00
Chain for elevating the carriages, 60 feet of half inch chain, = 500 pounds, at 10 cents.....	50 00
5 iron sheaves for the above, 60 pounds, at 10 cents per pound.....	6 00
Coal bunkers under deck for 50 tons of coal, with scuttles, iron grated on deck.....	75 00
12 berths for crew.....	25 00
2 large anchors, 800 pounds each, = 1,600 pounds, at \$100 each anchor, or 12½ cents per pound.....	200 00

2 small anchors for kedging, 200 pounds each, = 400 pounds, at $12\frac{1}{2}$ cents per pound.....	\$50 00
1 chain cable of 70 fathoms, of $\frac{7}{8}$ inch best wrought-iron, 4,000 pounds, at 10 cents.....	400 00
1 hemp cable 100 fathoms long, of five inches round.....	100 00
2 warp lines of Manilla, three inches round, each 100 fathoms long.....	100 00
1 writing table and 6 common chairs.....	12 00
1 stove and pipe for the cabin.....	20 00
1 cooking stove for use of crew.....	35 00
For 4 mud scows of oak, with drop bottoms, the wells to hold 25 cubic yards, at \$375 each.....	1,500 00
4 elevating windlasses with chains and cogs for working the drop bottoms of the 4 mud scows, at \$18 each.....	72 00
Contingencies, such as extra blacksmith's work, &c.....	240 00
Amount of estimate for a steam dredge-boat for Chicago harbor.....	<u>17,500 00</u>

6. For a set of meteorological instruments for observations at Chicago harbor, Illinois:

For 1 syphon barometer, by James Green, of New York.....	\$35 00
For 1 standard thermometer, to be graduated from 240° above to 42° below zero, of Fahrenheit.....	7 50
For 1 wind-gauge, or anemometer, of the best construction.....	65 00
For 1 rain-gauge, best description.....	22 50
For one electrometer, to denote the electrical state of the atmosphere.....	35 00
For one cyanometer.....	10 00
For one hygrometer.....	5 00
For one photometer, to measure the intensity of the light	17 50
For one geo-thermometer, to measure the earth's temperature near the surface.....	10 00
For one sympiesometer, to measure accurately the atmospheric pressure in sudden storms or in sudden changes.....	25 00
Amount required.....	<u>232 50</u>

7. For dredging Chicago bar and harbor:

For the excavation and removal of 20,000 cubic yards of light silt, at 10 cents per cubic yard.....	<u>\$2,000 00</u>
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RECAPITULATION OF ITEMS.

1. For repair of piers in stone masonry.....	\$115,454 66
2. For repair of second section with oak timber.....	232 89
3. For repair of third section with oak timber.....	1,933 64
4. For machinery, pay of assistants, office rent, fuel for same, stationery, commutation for quarters and fuel of the superintending engineer for one year, survey of harbor, &c.....	7,579 00
5. For a steam dredge-boat for Chicago harbor.....	17,500 00
6. For a set of meteorological instruments for Chicago harbor.....	232 50
7. For dredging Chicago bar and harbor.....	2,000 00
Amount of estimates.....	144,932 69

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lieut. Col., Sup. Eng., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, November 15, 1856.

A 21.

Estimate of the cost of extending the south pier of Chicago harbor 480 feet to the eastward, which will require the addition of 15 cribs, each 32 feet long, 20 feet wide, and 20 feet high from bottom to top, or 15 feet high from the bottom to the level of the lake surface, to be constructed in accordance with the drawings given in detail on sheet G No. 20, now in the Topographical Bureau, and a duplicate of which is now in the custody of the Superintendent of Public Printing, or the Secretary of the Senate, at Washington.—(See table T 2, at page 14 of Senate Executive Doc. No. 77, of the 34th Congress, 1st session. See also the formula for computation, at page 13 of the same document. This table and the formula will also be found in Part I of this volume.)

1. The estimated cost of one such crib is as follows, viz :

For 2,419 lineal feet of pine timber, hewn or sawed, 1 foot square, at 18 cents per lineal foot.....	\$435 42
For 880 lineal feet of white oak timber, hewn or sawed, 1 foot square, at 20 cents per lineal foot.	176 00
For 1,482 feet, board measure, of white oak plank 3" by 8", for flooring, at \$22 per M.....	32 60
For 3,167 pounds of 1 inch square wrought-iron for bolts, at 4 cents per lb.....	126 68
For 137 lbs. of wrought-iron spikes, $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, at $7\frac{1}{2}$ cents per lb.....	10 28

For 63 cords of hard boulder stone for crib ballast, at \$8 per cord of 128 cubic feet.....	\$508 00
For labor, carpentry, and superintendence, and expense of sinking in position, and filling with stone.....	500 00
Sum.....	1,788 98
Add 10 per cent. for contingencies.....	178 89
1. Estimated cost of 1 crib.....	1,967 87
2. Then 15 cribs, at \$1,967 87 each, will cost.....	29,518 05

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lieut. Col., Sup. Eng., &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, November 15, 1856.

2.—WAUKEGAN BREAKWATER, ILLINOIS.

The bureau was informed by my last annual report (No. 116, of the 31st of December, 1855,) of the condition of this work at that time, and also of the fact that the appropriation granted for it in 1852 was exhausted. My views in regard to the importance of this breakwater, accompanied by an illustrative map, marked G, No. 29, on a scale of $\frac{1}{2400}$, or 200 feet to one inch, were fully set forth in that report, together with an estimate, in full detail, of the cost of completing the work, as it was designed by the Board of Topographical Engineers, amounting to the sum of \$137,966 10.

The said map, which is essential for reference in order to a full understanding of the subject, is now in possession either of the Superintendent of Public Printing or the Secretary of the Senate, at Washington, whither it was sent for the use of the engraver.

The report alluded to will be found printed in Senate (Executive) Document No. 77, of the 34th Congress, 1st session, together with all the commercial statistics from page 123 to page 136, inclusive.*

I recommend that the plan and estimate therein set forth be now adopted, and that the amount estimated be divided into three separate annual appropriations, as follows, viz:

For the 1st year.....	\$60,000 00
For the 2d year.....	38,983 05
For the 3d year.....	38,983 05
Amount of the estimate.....	137,966 10

This arrangement will allow the timber and other materials to be procured the first season somewhat in advance of the actual requirements for the two next seasons, and thus prevent delays in going on with the work.

* It will also be found in the reprint of that document, contained in part I of this volume.

The work has been now suspended for a year, for the want of further appropriations to carry it on. The consequence is, that a crib which was nearly finished, and which had to lay exposed to the action of the sea in the most violent gales from the northeast and east, has been lost. It cost nearly \$3,500, and could easily have been completed and secured in its proper position during the month of June last, had an appropriation been granted for proceeding with the work.

It is bad economy to grant sums so very small for carrying on these works as to deprive the engineer of the necessary appliances for securing his work against such vicissitudes as are liable frequently to occur. Had those appliances which were really necessary to ensure success been procured out of the last appropriation for this work, it would have left very little means available for proceeding with its construction.

3.—KENOSHA HARBOR, WISCONSIN.

The former appropriation for this harbor having been exhausted, no work has been done there by the United States the past season.

In regard to the importance of this harbor, and the work required to be done for its completion, I beg leave to refer to my last annual report, printed in Senate (Executive) Document No. 77, of the 34th Congress, 1st session, from page 136 to page 176, inclusive,* and also to the maps and drawings which accompanied that report, marked G, No. 10, G, No. 30, and G, No. 31, duplicates of which are now in the custody of the Superintendent of Public Printing or the Secretary of the Senate, prepared for the engraver; also to the accompanying map G, No. 42, from a survey made in the early part of June, 1856.

The commercial statistics of this port for the year 1855, and the estimates, with a full detail of items, are set forth in that report, and may be adopted as applicable to the subject at this time.*

The estimates of cost for completing this harbor are, under the several heads presented, as follows, viz:

1. For the protection of the harbor from a deposit of the drifting sand blown across the piers into the channel....	\$750 00
2. For the extension of the harbor piers.....	19,096 88
3. For dredging, necessary to produce a depth of 12 feet of water over the bar and between the United States piers, and also a depth of 10 feet in the proposed channel E F (see map G, No. 30) 600 feet long by 160 feet wide.....	8,464 80
4. For deepening the basin to 10 feet of water west of the United States piers.....	9,669 22
5. For increasing the capacity of this basin, by deepening its north and west arms to 10 feet of water.....	20,065 34
Amount required to be appropriated to complete Kenosha harbor, Wisconsin.....	58,047 24

* These statements are also given in part I of this volume.

This sum can be judiciously expended in a single season or, at furthest, in a season and a half; and I would recommend that the whole be granted in the first appropriation to be made.

A comparison of maps G, No. 30, from a survey made in December, 1855, and G, No. 42, from a survey made in June, 1856, will show that the effect, upon the currents, of the long bridge-wharfs, belonging to Elkins, Hale & Ayer, and Durkee & Treusdell, has been to increase greatly, between these two periods, the deposit of sand in the mouth of the harbor.

I must repeat the recommendation that some action be taken to compel the curtailment in length of these pile-wharfs. My views on this subject will be found fully expressed in my last annual report at pages 140 and 141 of printed Senate Document No. 77, of the 34th Congress, 1st session.*

A duplicate of this map G, No. 42, will be forwarded for the use of the engraver as soon as it can be finished.

4.—RACINE HARBOR, WISCONSIN.

The appropriation made in 1852 for the improvement of this harbor was all expended last year and the year before, and consequently no work has been carried on there by the United States during the season of 1856.

I have only, therefore, to refer to my last annual report (No. 116,) of the 31st of December last, printed in Senate Document (Executive) No. 77, of the 34th Congress, 1st session, from page 176 to page 195, inclusive, and reprinted in part 1 of this volume, as containing all the information and the recommendations I have to offer now in relation to this harbor. Also, to the maps and drawings marked G No. 15, G No. 31† and G No. 32, duplicates of which are now in the custody of the Superintendent of Public Printing, or of the Secretary of the Senate at Washington, prepared for the use of the engraver.

The commercial statistics of this port for the year 1855, and the estimates, in full detail, of items for the completion of this harbor, are given in that printed report, and I offer them as applicable to the subject now.

The estimates of cost for completing this harbor are, under the several heads presented, as follows, viz:

1. For completing the pier extensions according to the plan which is approved by the Board of Topographical Engineers	\$38,066 91
2. For dredging to produce a depth of 12 feet over the bar and between the United States piers.....	4,817 20

* A corrected reprint of that annual report is contained in part I of this volume.

† The drawings on sheet G No. 31 have reference both to Kenosha and Racine harbor improvements.
J. D. G.

3. For a <i>chevaux-de-frise</i> sand barrier (see sheet G, No. 31,) 504 feet long.....	\$630 00
4. For a set of meteorological instruments.....	232 50
5. For two periodical surveys to show the effect of the proposed pier extensions on the character of the harbor, and of the bar at the harbor entrance.....	245 84

Amount required to be appropriated to complete Racine harbor, Wisconsin..... *43,992 45

I would recommend that the above sum be granted at once by one appropriation. It can be judiciously expended in one season.

5.—MILWAUKIE HARBOR, WISCONSIN.

My last annual report, (No. 116,) dated December 31, 1855,† sets forth in full detail the work done on the three first or city sections of this harbor improvement at the “north or straight cut,” during the past season. Active operations were resumed upon these sections on the first of April, 1856, and have been continued to the present time. Forty-three cribs, each 32 feet long and 20 feet wide, have been completed and sunk in position the past season, besides 260 feet in length to form the protection to the sides of the “straight cut,” composed of cribs 10 feet wide.

The length of pier work thus formed on the north side is 672 feet, having a width of 20 feet, and 260 feet in length, having a width to support the north side of the cut of 10 feet. Total length of the north pier, 932 feet.

The length of pier formed on the south side, composed of 22 cribs, each 32 feet long and 20 feet wide, is 704 feet.

This nearly completes the piers of the three city sections, all except one crib, 32 feet long by 20 feet wide, yet to be added to the north pier. All these cribs are raised to a height of 4 to 4½ feet above the level of the surface of the lake, and they have consequently yet to be raised a foot higher.

The number of cubic yards of sand excavated and removed by the dredging machine on these three city sections was, in 1855, about.....	18,000
In 1856, the number of cubic yards thus removed, was..	27,000

Total cubic yards removed.....	45,000
--------------------------------	--------

The number of cubic yards yet to be removed on these three sections, in order to obtain a depth of 12 feet of water, is.....	25,600
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* The \$70 credited to this estimate in last year's report have since been expended and accounted for. J. D. G.

† A corrected reprint of this report is found in part I of this volume.

The portion of work to be done in order to complete these three city sections, including the above dredging, will easily be accomplished early next season.

The work is now, therefore, in a favorable condition to allow to us go on with the 4th or United States section. Advantage will be taken of the present winter to have the requisite stone ballast hauled in on sleds while the snow is on the ground, so that we may put together the timbers which have already been framed to form cribs towards constructing this section. The funds on hand appertaining to this work will be disposed of for these objects the ensuing winter and spring, as far as they will go.

For the completion of this 4th or United States section,

I have only to refer to the estimate submitted for that part of the work in my annual report (No. 116) of last year. It will be found in full detail of items at pp. 232 and 233 of printed Senate (Executive) Document No. 77 of the 34th Congress, 1st session, marked there E 31.* It amounts to the sum of.....

\$32,802 60

From which deduct as follows :

Value of dressed timber now on hand..... \$3,150 40

Balance remaining of the former appropriation, say November 15, 1856.....

5,384 45

8,534 85

Amount of appropriation required to complete the 4th section of the Milwaukie harbor, at the "North Cut."

24,266 75

The importance of keeping in good repair the piers of the old harbor at the mouth of Milwaukie river, and of keeping the channel there clear of obstructions to navigation, is fully set forth in my last annual report. The remarks then presented upon that point will be found at page 202 of the printed Senate Document before mentioned, (also in part I of this volume.) I would ask especial consideration of them.

The estimate of Agent Gunnison, then presented for this object, to be found, marked E 33 or C, at page 235 of that printed document, and also in part I of this volume, is now renewed. It amounts to.....

\$23,784 26

Also the estimate for a set of meteorological instruments for observation at this harbor, marked E 34, at page 236 of the same document, and also found thus marked in part I of this volume, amounting to.....

232 50

The following is, then, a recapitulation of estimates now presented and recommended for adoption for the improvement of this harbor :

1. To complete the 4th section of the "North Cut.".... \$24,266 75
2. For the repair and improvement of the old harbor at the mouth of Milwaukie river..... 23,784 26

* It is also contained in part I of this volume, marked E 31.

3. For a complete set of meteorological instruments.....	\$232 50
Amount required to be appropriated for Milwaukie harbor.....	48,283 51

This is on the supposition that the city of Milwaukie will complete the 1st, 2d and 3d sections with the means raised by that corporation.

I would recommend that the whole of the above sum of \$48,283 51 be granted at once in a single appropriation. It can be judiciously expended in one season.

In regard to the importance of this harbor, in a national as well as in a general commercial point of view, and the extent of its commerce, shown by the statistics collected for the year 1855, I beg to refer to my last year's report, printed in the above mentioned Senate document, from page 195 to page 248, (reprinted in part I of this volume,) and also to map G, No. 16, showing the character of the harbor, a duplicate of which is now in the custody of the Superintendent of Public Printing, or the Secretary of the Senate, at Washington, prepared for the use of the engraver. It is very important that these maps be printed, for it is only in this way that the topographical statistics of these important harbors can be fairly collated, for the purpose of elucidating the most important phases which have to be discussed in order to arrive at the best plans for their improvement, for the benefit both of military defence in time of war, and of the general commerce of the country in time of peace.

6. SHEBOYGAN HARBOR, WISCONSIN.

I offer my annual report of last year in relation to this harbor as my report for the present year, for the reason that no work has been done here by the United States during the past season. That report, together with full estimates in detail of the cost of completing the improvement, and the statistics of the commerce of the port of Sheboygan for the year 1855, will be found in printed Senate Document No. 77, of the 34th Congress, 1st session, from page 248 to page 284. (That document is reprinted in part 1 of this volume.)

The estimate will be found at pp. 278 and 279 of that document, and also in part I of this volume, marked F 31. The items under the different heads amount as follows, viz:

1. For extending the harbor piers to 15 feet of water.....	\$36,189 50
2. For dredging the bar and harbor.....	1,892 55
3. For repairing the present piers.....	5,000 00
4. For a set of meteorological instruments.....	232 50
Total.....	43,314 55
From which deduct the balance turned over for the civil authorities of Sheboygan, on the 28th of July, 1856.....	6,139 30
Amount required to be appropriated to complete Sheboygan harbor, Wisconsin.....	37,175 25

A survey was made of this harbor in August, 1856, the expense of which was borne from the appropriation of 1852, exclusive of the sum turned over for the civil authorities, and the accompanying map, marked G, No. 45, shows the result of that survey. A duplicate of this map will be prepared as soon as practicable, and forwarded for the use of the engraver. It is very important that it should be printed for the information of the Board of Engineers, and for the use of navigators.

7. MANITOWOC HARBOR, WISCONSIN.

I must also request that my annual report for last year, in relation to this harbor, be accepted as my report for this year, for the reason that no work has, for the want of an appropriation, been carried on here during the season last past, and there is nothing new, therefore, to add in relation to it. That report will be found printed in Senate (Executive) Document No. 77, of the 34th Congress, 1st session, from page 284 to page 296, or end of part I of that report. (It is reprinted in part I of this volume.) Parts 2d and 3d of that report were not printed, but should be, as they relate to the Michigan city breakwater, in the State of Indiana, and to the harbors of New Buffalo, St. Joseph, Black Lake, Grand Haven, at the mouth of Grand river, and to St. Clair Flats and Clinton river, in the State of Michigan. (The omission, in regard to part 2d of the report of 1855, is supplied by this report for 1856, which embodies the same information.)

The statistics of the commerce of Manitowoc, and the estimates for completing the harbor, will be found in full detail in the above mentioned printed document, (and in part I of this volume.)

The estimate at pages 292 to 294 of that document, (and also found, marked G 4, in part I of this volume,) shows the following items under the several heads of cost, viz :

1. For the extension of the harbor piers.....	\$59,869 92
2. For dredging.....	2,678 50
3. For meteorological instruments.	232 50
Amount required to be appropriated for the completion of Manitowoc harbor, Wisconsin.....	62,780 92

The appropriation of 1852 for this harbor has been expended.

I would recommend that the above estimate be divided into two appropriations, as follows, viz :

For the first year.....	\$40,000 00
For the second year.....	22,780 00
Total, as above.....	62,780 00

This arrangement will be productive of economy in allowing materials to be procured somewhat in advance for the second season, and in preventing delay in the completion of the work.

This harbor, being the most northern one on Lake Michigan improved by the United States, offers the first safe refuge in storms for the immense amount of tonnage and commerce constantly passing from the other great lakes into Lake Michigan. It should, therefore, be completed as early as possible, and it may be done in two years, if the appropriations be granted as above recommended.

An accurate survey was made, under the direction of this office, of Manitowoc harbor, in August last. The accompanying map, marked G, No. 46, has been projected from this survey. A duplicate of it will be forwarded, as soon as practicable, for the use of the engraver.

It is very important that it should be printed, as it is derived from the only reliable survey that has been made here for many years.

The survey was made by assistant John O'Donoghue, who served, under my direction, in the northeastern boundary office, and afterwards, under my orders, on the Mexican boundary commission.

MICHIGAN CITY BREAKWATER, INDIANA.

No work having been done on this breakwater during the past season on account of the appropriation of 1852 being exhausted, I have to submit my report of last year in relation to this improvement as applicable at this time. It constituted a portion of part II of that annual report, which was left out in the printing of Senate (Executive) Document No. 77, of the 34th Congress, 1st session.

It embraces estimates of cost in full detail, and the statistics of the great extent of commerce interested in this work. Also views of its importance as a safe refuge for our armed ships in time of war; it is as follows, viz:

In regard to the position for this work, I beg leave to refer to the views which were expressed in full in my general report to the bureau (No. 73) of the 29th of April, 1855.

It was recommended in that report that the original plan of the Board of Engineers should be adhered to, of placing the work in a depth of 25 feet of water, so as to have it to rest on a clay bottom at an average distance of one thousand (1,000) feet lakeward from the isometrical curve of twelve (12) feet depth.

Thus situated, the breakwater would, when completed, afford an easy access and refuge for vessels generally during the prevalence of northerly and northeasterly storms, and the extent of roadstead would then be sufficient to accommodate the navigation of the great lakes, generally employed in commerce with the ports of Lake Michigan.

It was not until the 11th of August that the action of the board upon this point was received at this office. It is hereto attached, marked H 8. The board adhered to its modified or second plan, which required the breakwater to be placed in a depth of nineteen (19) feet of water, thus throwing it upon a sandy foundation.

It allowed the cribs to be constructed to a width of twenty-five feet,

instead of twenty feet, which had previously been directed for this depth of water.

In pursuance of this decision the work was immediately pushed forward with all possible industry. The accompanying documents, marked from H 1 to H 23, contain information in detail connected with it.

The cribs were constructed in conformity with the drawings shown upon the accompanying sheet, marked G No. 21,* or case 3d of crib work, except that the iron bolts were arranged as they are shown upon sheet G, No. 19.* This was assented to upon the representations of Agent Bowers, that he found it difficult to drive bolts as long as 30 inches into the highly seasoned oak which he had to deal with.

On the 14th September the first crib was completed to a height of 20 feet from the bottom timbers and successfully sunk in position.— See the report of Agent Bowers, hereto attached, marked H 12. Immediately after this the usual autumnal gale commenced. Its action against this crib caused the sandy foundation to be washed away to the depth of four (4) feet, and the crib consequently settled an equal quantity, but without any essential difference of level, thus adding another proof of the importance of the open latticed bottoms enjoined by the bureau and the Board of Engineers for all wooden pier work. The falling of the stone through the open interstices, thus supplying the place of the sand, as fast as it was washed away, ensured this result, (see Doc. H 13.)

It would seem, then, that no economy in the cost of construction was ensured by the placing of the cribs in 19 feet in lieu of 25 feet depth of water. The latter depth would have given us a clay bottom, not subject to any wash by the action of the lake waves.

Had the weather, on the subsiding of this gale, remained favorable long enough to have enabled the agent to carry out in the open scows stone enough to have supplied the place of that which was lost from the crib by the washing away of the sand at its bottom, this crib would, no doubt, have been permanently secured in its position, and would have had strength enough to have resisted ever afterwards the action of the lake sea. Unfortunately, however, before this new supply of stone could be effected, with the means at our command, another storm ensued on the 2d of October, of even greater violence than the preceding one. It washed the remainder of the sand from underneath the crib, and caused more stone to drop through the latticed bottom.

The roughness of the sea rendered it impossible to carry out in the scows more stone, to replenish what was lost. The scows would have been swamped in the attempt. The crib had now become deprived of its stone ballast to such an extent as to lose that *vis inertiae* which was necessary to enable it to resist the momentum of the lake waves, and it parted bodily three or four timbers above the latticed bottom. (In the report of Agent Bowers, of October 5, 1855, hereto attached, marked H 14, it is stated that the crib broke off “just above the upper

* Duplicates of these two sheets are now in the office of the Superintendent of Printing, or the Secretary of the Senate, at Washington, prepared for the use of the engraver.

grillage timbers," the position of the stranded portion of the crib did not then allow of an accurate examination upon this point. When I inspected the work early in November, I ascertained that the fracture took place three or four feet above the grillage bottom.) The bottom, together with the three or four courses of timbers next above it, remained, from the weight of the superincumbent stone, firmly anchored on the bottom. The upper portion was driven on the 14 feet shoal, towards the shore. For further particulars in regard to this disaster, I beg leave to refer to the report of Agent Bowers, of October 5, 1855, hereto attached, marked H 14.

When I inspected this work after the disaster, I made a minute examination of the effect of the shock upon the iron bolts. Not one of them had been started from the position where it was driven. The appearance of the fracture showed that the whole tier of bolts, sixty in number, formed of the toughest wrought iron, one inch square, had been drawn asunder by the absolute force of tension.

The excellence in quality of the iron, and the adhesion of the bolts in the places where they were driven, could not have been more satisfactorily demonstrated by any experiment.

However much the loss of this crib is to be regretted, I deem it due to Agent Bowers and his party to say, that it was, in my opinion, owing to no want of forecast or exertion on their part to save it. The storm by which it was lost was the most violent of the season, and as violent, perhaps, as any that has ever occurred on this lake. Its effect, under the circumstances, was beyond human control.

A second crib had been brought so near to completion, that we expected to be able to finish it and sink it, also, in position before the close of the season. The misfortune to the first, however, required that the attention of the agent and his party should be given to the recovery, as far as possible, of the materials in the standard crib. This duty necessarily occupied them, as shown by the accompanying documents, marked H 15 to H 20, inclusive, until the 7th November, when the advanced state of the season required the active operations upon this work to be closed.

The increased cost arising from the loss of 75 cords of stone, which were delivered, under contract, at \$11 50 per cord, and of recovering the materials from the stranded crib, has very nearly exhausted the balance of the funds which was to have been appropriated to the completion and sinking in position of the second crib. The work cannot, therefore, progress further until another appropriation shall be made in its behalf. I will remark, that this second crib is bolted with round iron $1\frac{1}{2}$ inch in diameter.

Experience has, we think, fully shown that, in order to succeed in the construction of a breakwater in a position exposed as this is to the violent action of the open sea, other appliances, and a different system from that to which we were unavoidably confined by the scanty appropriation granted in 1852, are absolutely necessary. When a crib is built up to its proper height, and ready to be floated out to be sunk in deep water, upon the line designed for the breakwater, we should have the means necessary to ensure its proper alignment, and the deposit of the stone ballast within it, all within a few hours, say

within the space of a single day, or, if possible, within half a day ; otherwise, the intervention of rough weather will often check the operation of throwing in the stone, and thus leave the crib in danger of being driven by the force of the waves from its moorings, and, perhaps, of being destroyed.

No crib can be considered as secured in its position until all the stone ballast designed for it is put in.

For this object, and for obtaining the stone from a distance at a reduced price, we consider it indispensable, in the future operations here, to have a sail vessel—say a schooner of 350 tons burden, which will cost about fourteen thousand dollars (\$14,000,) completely rigged—and also a steam-power tug-boat of about 90 tons measurement, which, with her engine and machinery, will cost about fifteen thousand dollars (\$15,000.)

The schooner would be employed in bringing all the timber and stone required for the work from the vicinity of Green Bay, by which means a full supply of both would always be ensured at a greatly reduced cost. The steam-tug would be used in carrying stone enough, at a single trip, from the shore to fill each crib within six hours after its being aligned in position. Should any of the cribs be found to lose stone from the washing away of the soil at bottom during rough weather—a circumstance which is likely to occur within a short time only after they are sunk in position—this steam-tug could readily be laid alongside, and from her deck more stone could be thrown in, until a permanent *enrochement* were formed around the crib at bottom. This she could do in rough weather, when the open scows filled with stone could not venture out without being swamped.

By such an arrangement as this the crib which was lost in October last, and which cost about six thousand dollars, could easily have been saved, and permanently secured in position. These two vessels will be found included in the estimate for future operations, accompanying this report.

In regard to the position and dimensions of the breakwater designed for this place, I must respectfully repeat the recommendation contained in my report, No. 73, of the 29th of April, 1855, namely : That it be placed upon the natural clay bottom, in twenty-five (25) feet depth of water, which will bring it about one thousand (1,000) feet outside or lakeward of the isometrical curve of twelve (12) feet depth ; and I further recommend that the length of two thousand (2,000) feet, as was proposed in the original plan, be adhered to. In favor of the extent of roadstead, and sea room for vessels in approaching it, that would be thus obtained, the following remarks were submitted in that report, viz :

“ A vessel in rounding to in a gale of wind should not be subjected to run into less than 12 (twelve) feet before finding her final anchorage behind this breakwater ; and one thousand (1,000) feet breadth of sea room and roadstead is the least, I would respectfully submit, that ought to be provided—especially in view of a crowd of vessels which would often be seeking shelter at the same time from a northerly or northeasterly gale behind this work. For the reason given in treating of the importance of the Waukegan breakwater, vessels failing,

for want of room in luffing, to make a harbor between the piers at the mouths of the rivers along the lake shore, would often be compelled to seek refuge behind the Michigan city breakwater. It would, indeed, often be their last resort and hope, situated, as it will be, near the southern extremity of the lake. I would respectfully submit for consideration the question: Is not the subject of *adequate sea room and capacity of roadstead* of more importance, in deciding this matter, than that the arc of protection, (covering the pile piers or landings of the town,) secured by the length originally given for 25 feet of water, should be scrupulously adhered to?

“The greater facility for reaching the point of refuge, by the extent of sea room afforded, appears to me of leading importance. There is another consideration of importance which attaches to this question, namely: the greater and more unfavorable influence of ground swell, or action of the reflux waves,* upon vessels riding at anchor in the shoaler, than in the deeper water, secured by the respective positions proposed for the work. To render it efficient it must be hereafter extended on either plan, and I would recommend that its commencement be in the deep water.”

The answer of the Board of Engineers to the above remarks, hereto attached, marked H 8, seems to be based upon the necessity which existed from the want of an ample appropriation of limiting their second plan for this breakwater to providing merely for the accommodation and security of the local commerce of Michigan city.

I would respectfully submit, in answer to this, that any breakwater constructed at the public expense upon this lake, wherever situated, ought to provide for ample accommodation as a harbor of refuge during northerly and northeasterly storms, not only of the shipping of Lake Michigan, and the other great lakes having water communication with her, but likewise of the armed fleet which, in time of war, would evidently have to be maintained upon Lake Michigan.

The value of this commerce and the extent of the civil marine which is constantly engaged in promoting it, both of which require protection from a work of this sort, may readily be inferred from the statistics exhibited in the previous and subsequent parts of this report.

It will there be seen that the value of the commerce and tonnage which were afloat upon this lake in the year 1855 alone amounted to the immense sum of \$218,297,348 78—that is to say, two hundred and eighteen millions two hundred and ninety-seven thousand three hundred and forty-eight dollars and seventy-eight cents—was the amount of capital actually afloat on the lake during the navigable season of 1855, and directly interested in the work under consideration. Had such a breakwater as is recommended then existed, there was scarcely a vessel that was exposed to the violent and destructive gales which occurred during that season which would not have sought refuge behind it rather than to have incurred the hazard of attempting to make a harbor in any of the narrow-mouthed rivers along the lake coast. We have already dwelt upon the difficulty of entering in safety these rivers during severe northerly and northeasterly storms, and have

* *Under tow*, as it is sometimes called in nautical phrase.

explained the cause.—(See Senate Ex. Doc. No. 77, of the 34th Congress, 1st session, p. 125, beginning at the 6th paragraph, and p. 126, under the head of Waukegan breakwater; reprinted in part I of this volume.)

The value of the commerce and tonnage afloat, as above stated, is shown as follows, viz:

1. Chicago, Ill. Value of imports by lake, see statement A 34, (see part 1 of this vol.).....	\$100,752,304	41
2. Do. Value of exports by do., statement A 37, (see do.).....	34,817,716	32
3. Waukegan, Ill. Imports by lake, statement B 4, (see do.).....	528,319	87
4. Do. Exports by do., statement B 6, (see do.)....	491,408	00
5. Kenosha, Wis. Imports by lake, statement C 33, (see do.).....	2,547,668	00
6. Do. Exports by do., statement C 34, (see do.)....	2,460,267	0
7. Racine, Wis. Imports by lake, statement D 10, (see do.).....	3,347,781	43
8. Do. Exports by do., statement D 11, (see do.)...	686,496	17
9. Milwaukee, Wis. Imports by lake, statement E 36, (see do.).....	18,860,298	50
10. Do. Exports by do., statement E 40, (see do.)..	14,863,482	91
11. Sheboygan, Wis. Imports by lake, statement F 33, (see do.).....	6,749,461	00
12. Do. Exports by do., statement F 34, (see do.)..	1,003,564	00
13. Manitowoc, Wis. Imports by lake, statement G 6, (see do.).....	305,126	00
14. Do. Exports by do., statement G 7, (see do.)...	446,499	40
15. Michigan City, Ind. Imports by lake, statement H 22, (see part 2.).....	61,267	00
16. Do. Exports by do., statement H 23, (see part 2.)	10,819	00
17. New Buffalo, Mich. Imports by lake, statement I 1, (see part 2.).....	30,019	50
18. Do. Exports by do., statement I 2, (see part 2.)	18,878	14
19. St. Joseph, Mich. Imports by lake, statement K 2, (see part 2.).....	166,337	75
20. Do. Exports by do., statement K 3, (see part 2.)	207,170	00
21. Grand Haven, Mich. Imports by lake, statement M 4, (see part 2.).....	1,752,160	14
22. Do. Exports by do., statement M 5, (see part 2.)	1,199,468	00
23. Estimated value of the imports, exports and tonnage employed therefor of all the other ports of Lake Michigan than those enumerated in our statistics, being Port Clinton, Port Washington, Two Rivers, Kewaunee, White Fish Bay, Dougall Harbor, Mackinaw, Monastique, Beaver Harbor, Big and Little Traverse Bays, Manistee, Marquette, White River, Muskegan Harbor, Kalamazoo River and South Black River, in the aggregate for the year 1855—a low estimate.....	9,850,000	00

24. Estimated value of the imports, exports and tonnage employed therefor of all the ports of Green Bay, including Green Bay Harbor, Big and Little Sturgeon Bays, Peshatego River, Menomonee River, Cedar River, Little Bay de Noc, Big Bay de Noc—a low estimate.....	\$10,530,000 00
25. Value of the tonnage of Chicago, Ill., statement A 42.....	1,088,801 74
26. Value of the tonnage of the other enumerated ports of Lake Michigan, from B to M, or from Waukegan to Grand Haven, inclusive.....	779,334 50
27. Value of the tonnage of Detroit, and of the ports of Lakes Huron, Erie and Ontario, <i>via</i> the Welland canal, engaged in navigating Lake Michigan in trading with her ports, for the year 1855.....	4,742,500 00
Total value of commerce and tonnage actually afloat on Lake Michigan in 1855, which were interested in the construction of this breakwater.....	218,297,348 78

It is not then for the local commerce of Michigan city alone that this breakwater is designed, respectable as that commerce will presently be shown to be, although unaided by any work calculated to facilitate her lake-wise trade.

But even apart from the above considerations, there is a local interest in this contemplated improvement of a magnitude and importance extending far beyond any exhibit which, so far as we know, has been made in any of the public reports on this subject. It is an interest which extends to the whole State of Indiana, and indeed in a very important degree to the northern portion of Kentucky.

Michigan city is situated at the lake-coast terminus of the New Albany and Salem railroad. This railroad is 278 miles long, and lies entirely within the State of Indiana. It commences at New Albany, which is situated on the Ohio river, nearly opposite Louisville, Kentucky. It runs thence in a direction nearly north passing through La Fayette and Indianapolis, and dividing the State of Indiana into two sections, very nearly of equal area, and terminates at Michigan city, which is the only lake port belonging to this State. It is very important to the agricultural interests of this State that her products should here find a good harbor for their safe transmission by lake navigation in seeking the eastern markets. Without a good harbor at this terminus of the railroad a transshipment cannot be safely made, and the farmer is now compelled to continue the transportation of his wheat, corn and other products to Detroit by railroad, at an expense much greater than it could be done for by lake shipment. We estimate, on careful inquiry, that 35 per cent. would be saved on the present cost of this transportation if there was a good harbor at Michigan city to render a transshipment there secure.

It is to relieve the people of Indiana from this additional expense that they are so desirous for the improvement in question.

Whenever the New Orleans market becomes glutted by the great

quantity of grain, &c., drawn thither, and which always causes prices to fall, it becomes the interest of the agriculturists of the northern part of Kentucky to seek the markets of the northern Atlantic sea-ports to dispose of their grain. This is, indeed, not unfrequently the case, and they are dependent upon this New Albany and Salem railroad for its transportation to Michigan city, which is the nearest lake port for them. Hence they are directly interested in this breakwater, because it will make a safe harbor for the transshipment of their property lakeward, in search of the best market.

I regret that I have not been able to obtain the statistics in detail of the amount and value of the various articles of commerce that reached Michigan city by this railroad in the year 1855. I hope to be able, however, to present them in my next report.* From careful inquiry I believe the value must have amounted in the year 1855 to full twenty-five million dollars. Say \$25,000,000.

This, then, may be assumed as an approximate estimate of the value of the local trade which is directly interested in the construction of this breakwater. Great as this interest is, it is by no means commensurate with that of the commercial community of these great lakes, taken in the aggregate, whose commerce and shipping need such a harbor of refuge and ready access, in times of perilous storms, which occur frequently on this lake, and every year, for the want of such protection to the shipping, cause a great destruction of human life and of property.

In time of war, no navy could be sure of maintaining its prowess upon this lake, or of extending the necessary protection to its coasts, without the benefit of such harbors as would be formed by works of this sort, behind which it could find a ready and safe refuge during these violent gales.

The only conflicts we have ever had with any power, where fleets were opposed to fleets, occurred on those lakes. In case a war should unfortunately occur again between the same powers, the greatest trial of naval strength between them would, undoubtedly, be upon these lakes. These conflicts, by deciding the mastery afloat, would also go a great way towards deciding that of the adjacent coasts and lake ports; and both powers being within ready reach of these unlimited resources, which are the real elements of strength in war, would be enabled to deal out, each against the other, a power of arms afloat that could scarcely be equalled on the great ocean. Each would, then, undoubtedly vie with the other in endeavoring to have the superior armament. Where naval skill, physical strength, and national bravery were equal, supposing the one power to neglect and the other to provide harbors of safe refuge for her armed ships against the violent lake storms which often occur, the conclusion is evident that the mastery would thereby be ensured to the latter.

Since I have been stationed here I have been deeply impressed with the importance of giving due attention to these elements of military defence on our extended lake frontier. They are but the pru-

* *November 15, 1856.*—The exhaustion of the appropriation for the Michigan city breakwater has deprived me of the means of obtaining these statistics for this year.

dent preparations against the vicissitudes of war, which every government should be mindful of in time of peace; and the people of these lake-bordered States, who have so cheerfully and so liberally contributed their share towards every necessary preparation for the military defences of the national Atlantic border, feel that the timely protection of their commercial cities, and of their homesteads in the northwest, should not be neglected.

I would earnestly recommend to favorable consideration the economy of planning the works for harbor improvements at those ports on this lake which would become important *points d'appui* in time of war, in a manner to combine the requisite accommodations for the civil marine engaged in commerce in time of peace, and for our naval ships in time of war. A very small proportion, added to the expense requisite for the first mentioned object, will accomplish both, and give to these works that national character which will always entitle them to the fostering care of the country. The great advantage of this system would be that the first and most necessary element in the military defences of this extensive lake coast would be secured in time of peace. To defer this important measure until war occurs is but to point out to the enemy our vulnerable positions, and thus enable him to seize upon them before the requisite defences can be perfected.

I submit the following estimate of the cost of the proposed breakwater, assuming that it is to be two thousand (2,000) feet long and 30 feet wide, and to be placed in water 25 feet deep, and to be 32 feet high from bottom to top, or to rise 7 feet above the water surface.

1. *Estimate of the cost of a single crib, 30 feet long, 30 feet wide, and 32 feet high from the bottom to the flooring at top.—(See sheet G No. 21, or case 3 of crib work.)*

For 6,210 lineal feet of white oak timber, hewn and dressed, 1 foot square, at 22 cents per foot.....	\$1,366 20
For 2,160 feet, board measure, of white-oak plank, 3 inches thick, at \$20 per M.....	43 20
For 8,060 pounds of round bolt iron, 1½ inch in diameter, at 4 cents per pound.....	322 40
For 164 pounds of wrought iron spikes, ¾ by ¾ of an inch square, at 7½ cents per pound.....	12 30
For 176 cords of boulder stone, for crib ballast, at \$10 per cord.....	1,760 00
Estimated cost of materials.....	3,504 10
Superintendence and workmanship.....	1,250 00
Add 10 per cent for contingencies, including meteorological instruments, as detailed in the estimate A 17, under head of Chicago harbor.....	475 40
Estimated cost of one crib, 30 feet long, 30 feet wide, and 32 feet high.....	5,229 50

2. Then, 67 cribs, at \$5,229 50 each.....	\$350,376 50
3. For the purchase of one schooner of 350 tons burden, with her rigging.....	14,000 00
4. For one steam-tug boat, complete.....	15,000 00
5. For machinery and tools, in addition to those on hand.....	5,000 00

Estimated cost of the Michigan City breakwater, Indiana,	<u>384,376 50</u>
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It would require five years to complete this work; and as the stock of timber for one-half the work should be procured in advance, in order to benefit the seasoning, I would recommend that the yearly appropriations for the work be as follows, viz:

The 1st year.....	\$100,000 00
2d year.....	71,094 50
3d year.....	71,094 00
4th year.....	71,094 00
5th year.....	71,094 00
Total, as above.....	<u>384,376 50</u>

Michigan City is a port of delivery for foreign importations, and belongs to the collection district of Chicago.

There is a deputy collector stationed here. There is a coast light-house here. No duties were collected here in the year 1855, nor for several years previous, for want of a harbor to secure the safe landing of freights.

The accompanying statement, marked H 21, shows that the number of arrivals and departures at this port, in the year 1855, was 180.

The amount of tonnage which arrived and departed during that year was 8,700 tons. The value of merchandise received at this port, during the year 1855, was, as per the accompanying statement, marked H 22.....

The value of merchandise shipped from this port in 1855, as per the accompanying statement, marked H 23, was.....	\$2,177,138 30
	1,772,955 65

Total value of receipts and shipments at the port of Michigan City, Indiana, in the year 1855.....	<u>3,950,093 95</u>
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The above sum does not, of course, include the valuation of merchandise and agricultural produce which arrived at Michigan City by the New Albany and Salem railroad, nor the merchandise which arrived there from Detroit and Chicago, and which was forwarded thence by the aforesaid railroad into the interior of Indiana and Kentucky.

As before stated, that merchandise was deprived of the advantage of lake shipment for the want of the contemplated breakwater.

H 1.

Colonel Graham to Colonel Abert.

[Extract.]

[No. 96.]

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, July 8, 1855.

SIR: * * * * *

In my report, No. 73, of April 29th last, I presented, at pages 22 to 29, my views in regard to this work; and, under the regulations of the department, I recommended a reconsideration and modification of certain parts of the plan of the board, and gave my reasons, in detail, for these changes. I now respectfully ask—provided it is consistent with the regulations of the department for me to do so—the authority to finish the two cribs for this work to a width of 25 feet, and to sink them on the outer or lakeward curve of 19 feet depth of water.

The chief interest which the United States will have in this work, when completed, will consist in the protection it will afford to our armed vessels in case of a war with our neighboring foreign power. I endeavored, in my report No. 73, to set forth the peculiar advantages it will possess over the other harbors improved by the usual pier work, running nearly at right angles with the most dangerous gales of wind which proceed from the north and northeast, provided a sufficient space between the breakwater and the shore is secured for an ample roadstead, and the easy access of vessels, without having to run into water of a less depth than 12 feet in seeking a safe anchorage behind the breakwater.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lieut. Col., Sup. Eng., &c.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

H 2.

Colonel Graham to Agent Bowes.

[Extract.]

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, July 20, 1855.

SIR: * * * * *

I sent to you on Saturday two other drawings for crib work, marked "case 1" and "case 3." I have to-day received a communication from the Topographical Bureau stating that the subject of my letters of the 29th of April last and the 8th inst., relative to the width of the cribs and the depth of water in which they shall be placed for the

breakwater of Michigan City, is now under consideration by the Board of Engineers, and will be immediately disposed of.

You will, therefore, please defer shortening the timbers for the cross-ties of the cribs until this decision of the board is communicated. In order, however, to avoid, as much as possible, the loss of time, you will proceed to have one end (the best, where there is a preference,) of each cross-tie dressed according to the model, leaving the other end until the matter before the board is decided. We will then know whether "case 2" or "case 3," of the drawings sent to you, will govern in the work.

Having understood from you, when I saw you on the 17th inst., that you found difficulty in driving a bolt as long as 30 inches into your well seasoned oak timber, you are authorized, if, on further experiment, you find that difficulty confirmed, to adopt the length and arrangements of the bolts shown in the drawing, marked "case 1." It was only in regard to this branch of the subject that this drawing was sent to you.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Lieut. Colonel, Superintending Engineer.

JOHN R. BOWES, Esq.,

U. S. Agent, Michigan City, Indiana.

P. S.—Have you ordered the $1\frac{7}{16}$ * inch augers for the $1\frac{1}{2}$ inch round bolts? if not, please do so at once. The $1'' \times 1''$ square bolts are to be driven into holes of 1" diameter. This will give sufficient adhesion by the tension at the corners.

J. D. G.

H 3.

Agent Bowes to Colonel Graham.

OFFICE UNITED STATES PUBLIC WORKS,

Michigan City, July 28, 1855.

COLONEL: I would advise that one inch square iron be used in both cribs, and the one and a half ($1\frac{1}{2}$) inch round iron be either exchanged for one inch square or used on some other work. One inch square iron is of sufficient size, and any greater is really unnecessary for strength. The plan you have directed for the bolting of these cribs is such as to make it impossible to separate the timbers when bolted with one inch square iron, as the acid of the oak will at once corrode the iron, and greatly increase the power of adhesion. I wish you to advise me, by return of mail, if you accede to my proposal, as we are ready to bore the second crib, and only await your decision. By the

* NOTE.—Agent Bowes had stated to me, verbally, that he could not drive a $1\frac{1}{2}$ inch round bolt into the holes bored into his hard seasoned oak timber with a $1\frac{3}{8}$ inch auger. I am inclined since to think, however, that it was because sufficiently heavy sledges were not used. It was readily done at Waukegan, in the construction of the breakwater there, the bolts being in that case full 30 inches long. The sledges used at Waukegan weighed 23 to 25 pounds each.

J. D. GRAHAM.

change I have suggested, there will be a saving in cost of iron of over \$100; and as some of the timbers of the second crib had been bored for one inch iron previous to the adoption of the $1\frac{1}{2}$ inch, it will save the labor of boring them again for the $1\frac{1}{2}$ inch.

I hope you will be able to communicate to me a decision on the width of the breakwater at an early day, as the mode of dressing one end of the timbers for cross walls is not a very profitable way of working.

Most respectfully, I remain your obedient servant,

JOHN R. BOWES,

United States Agent.

Lieut. Col. J. D. GRAHAM,

Superintending Engineer, Lake Michigan Works, Chicago.

H 4.

Colonel Graham to Agent Bowes.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, July, 30, 1855.

SIR: Your letter of the 28th inst., was received to-day. The $1\frac{1}{2}$ inch round bolt iron, which has been shipped to you, and which ought to have reached you by this time, must be used in bolting the cribs, (as far as it will go,) for the Michigan City breakwater. This is required by the general instructions of the War Department, and must receive your special attention. When the instructions of the 20th instant were issued to you, requiring that one of your cribs should be bolted throughout with this $1\frac{1}{2}$ inch round iron, and the other throughout with the $1'' \times 1''$ square iron, I was not aware of the fact, since communicated, that a portion of *each* of the crib timbers had already been bored for $1'' \times 1''$ square bolts. Understanding from you now that such is the case, you will not alter any of the holes that were previously bored, but will fill them with the $1'' \times 1''$ square iron, when you come to fasten the timbers together; and a portion of each of the two cribs must be bolted with the $1\frac{1}{2}$ inch round iron, so as to use all of that description already furnished to you in constructing the two cribs. On inquiry among the dealers in iron, it is found that the round iron cannot be exchanged without a loss to the government that is altogether inadmissible.

Go on as fast as possible in dressing one end of each cross-tie, agreeably to the instructions of the 20th instant. The action of the Board of Engineers and the department, in regard to the width of the cribs, will be communicated the moment it is received.

Please inform me when the iron and other articles shipped arrive.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer.

JOHN R. BOWES, Esq.,

U. S. Agent, Michigan City, Indiana.

H 5.

*Agent Bowes to Colonel Graham.*OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, August 3, 1855.

COLONEL: I have the honor to report the operations at this harbor for the month of July, 1855, to have been the framing and boring of 8 longitudinal grillage timbers for the two cribs; boring 75 longitudinal timbers for 20-inch bolts of 1-inch square iron; boring 37 longitudinal timbers for 20-inch bolts of 1½-inch round iron; framing one end of 100 cross timbers; bringing scow from St. Joseph harbor: this scow had to be taken out of the water, a portion of the plank of her bottom taken out and replaced with new ones, entirely recaulked, and otherwise strengthened and repaired, which has been accomplished, and she is now ready for service. An old crane scow, belonging to this work, has been raised from the bottom of the river with great difficulty, as she was entirely embedded in and filled with sand. She has been placed on blocks, to be caulked and otherwise repaired after she is sufficiently dry, which will be in a few days. I shall raise another old scow belonging to this work, and if found sound, she will be repaired, to be used in boating stone and other service in sinking the cribs. These three scows will all be ready for service by the middle of the month; and if I can have early instructions in relation to the width of the crib, I think that the timber for both cribs can be made ready to sink by the last of the present month. If, however, this information is not received in a few days, I shall be obliged to discharge a portion of my mechanics, which will be a serious evil in delaying the work; and as mechanics are scarce, it would be difficult to obtain them again. My present gang have been well drilled in the manner of working, and are therefore better than fresh hands, and it is therefore for the interest of the work to retain them.

If you could with propriety telegraph the bureau in relation to the width of the cribs, it would be desirable, as the season for sinking the cribs is fast wearing away.

Most respectfully submitted by your obedient servant,
JOHN R. BOWES,
United States Agent.

Lieut. Col. J. D. GRAHAM,
Sup. Eng., Lake Michigan Works, Chicago, Ill.

H 6.

Colonel Graham to Colonel Abert.

[By Telegraph.]

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, August 4, 1855.

Will I be authorized to construct the cribs for the Michigan City breakwater to a width of 25 feet?

The advance of the season makes me anxious to proceed.

J. D. GRAHAM, *Lieut. Col., &c.*

H 7.

Colonel Abert to Colonel Graham.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, August 7, 1855.

SIR: Your telegraph despatch was received; but as the matter was then before the board, as you were informed by my letter of the 16th July, it was considered better to await the revised opinion of the board, which was this morning received, and a copy of it is now sent to you.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Major J. D. GRAHAM,

Corps Top. Eng., Bvt. Lt. Col. U. S. A., Chicago, Ill.

H 8.

Report of the Board of Engineers on Colonel Graham's and Agent J. R. Bowes's recommendations in regard to the position and width of the Michigan City breakwater.

OFFICE BOARD OF ENGINEERS,
LAKE HARBORS AND WESTERN RIVERS,
Washington, August 7, 1855.

SIR: Upon the subject of Brevet Lieutenant Colonel Graham's and Mr. Bowes's communication respecting the board's plan of the harbor of Michigan City, I have the honor to make the following report:

Lieut. Col. Graham objects to the board's plan of the harbor of Michigan City, described in the report of October 25, 1853, (Ex. Doc. No. 1, pp. 214, 215,) because, in his opinion, it does not provide space between the breakwater and the shore for "*an ample roadstead*" and the easy access of vessels seeking a safe anchorage behind the breakwater; for he thinks that a crowd of vessels would often seek shelter in it at the same time from a northwardly or northeastwardly gale. Mr. Bowes objects to the plan that the cribs, of which it is proposed to form the breakwater, are to be founded in only 19 feet water on a sandy bottom, instead of 25 feet on a clay bottom; and that the length of the structure heretofore proposed by him the board has reduced from 2,000 feet to 1,090 feet, and that it has reduced the profile of the work from 30 feet base and 37 feet altitude to 20 feet base and 25 feet altitude, or from 12 feet to 6 feet above the level of the lake.

Amongst these objections to the plan of the board, the leading one would seem to be want of capacity as a roadstead and anchorage; and with this we will deal at once.

One of the first points of investigation referred to this board was, "that the board investigate the law in reference to the work at Michigan City, Indiana, that alternative being the continuance of the improvement of that harbor," or the laying down of a "floating breakwater and safety anchorage, as the Secretary of War may determine."—Act 30th August, 1852. On this reference, it was decided by the board that "a floating breakwater ought not to be recommended."

Under this decision, which had the sanction of the War Department, the work retained the character which the law had always given it, namely, *a harbor at Michigan City*.

Although the naked alternative of a roadstead or a harbor was not at any time formally presented for consideration, the board did not fail to direct its attention to it. But the magnitude and cost of forming a roadstead and anchorage was sufficient to deter the board from presenting a plan for such a work at Michigan City. In an anchorage, sufficient space must be left for each vessel to allow its swinging upon its anchor according to the changes of the wind, without being exposed to foul any other vessel; and it is usual, in reference to such works, to calculate upon a radius of two cables' lengths for ships of war, and about half that radius for merchant vessels. This would require an area of 2,880 feet diameter for the accommodation of each ship of war, or 1,440 feet for each merchant vessel. In the opinion of the board, a work of such magnitude was not only not contemplated by the acts of Congress making appropriations for the construction of a harbor at Michigan City, but it was not demanded by the wants of navigation.

The object of the plan reported by the board was, therefore, simply to provide a shelter for vessels outside of the coast line, where it had become evidently impracticable to establish a harbor on the land side. For such a work, Brevet Colonel (then Major) W. Turnbull gave a plan, based upon Mr. Bowes's survey of 1845—a plan which the board has aimed at following in all essentials, the area to be enclosed only excepted. This plan it was, and not Mr. Bowes's, that the board took as its model, and which it modified in its report of 1852.

In planning the several works committed to it by the department, the board was sometimes influenced by considerations other than those connected with the prospective wants of commerce. Amongst other considerations forced upon the attention of the board, by the history of these lake improvements, was the probability, or at least the possibility, that many of the projects, and this amongst the most probable, might have ultimately to be completed by private enterprise, without the aid and assistance of the general government. The board, therefore, thought it was permitted to keep in mind that an extensive project might defeat itself by reason of its magnitude, if perchance the work should be thrown upon the local resources of Michigan City. Under the influence of this apprehension, the board limited the extent of its plan to the probable actual wants of commerce; and this it could do in this as well as in other cases, without compromising the future, by giving such a form and position to the work as to admit hereafter of

an unlimited extension lengthwise of the coast at least, should the future wants of commerce require it.

The improvement proposed by the board consists of a line of crib work or breakwater ranging nearly parallel with the lake shore, in a depth of 19 feet. The agent for the work and the superintending engineer object, as I have already said, that the breakwater, in the plan of the board, lies too near the shore; and the agent adds his opinion that the work should be founded in a depth of twenty-five feet on a clay bottom, instead of 19 feet on a sand bottom, as proposed by the board—the agent's objection arising from an apprehension that the work may be undermined by currents which he imagines likely to occur at that depth. The superintending engineer objects likewise to the position of the breakwater, upon the ground that there is not sea room enough between the breakwater and the twelve-foot curve to enable vessels to round to safely; and he proposes to locate it upon the outer instead of the inner 19-foot curve, whereby he believes he will gain a passage of eight hundred instead of 400 feet to the anchorage, which he assumes should exist inside of the works. Moreover, both of these officers object to the dimensions which the board has proposed for the cribs, namely, a breadth of 20 feet by a height of 25 feet, and they propose to substitute for them a breadth of 25 feet and a height of 37 feet—Col. Graham resting his objection upon the general principles laid down by the board in its instructions relative to the formation of harbor piers; the agent resting his objections upon the fear that the cribs proposed by the board will not have sufficient stability to resist the force of the waves. In justification of these fears, the agent states that, "in the most tempestuous storms the waves at Michigan City do not vary much from 14 feet, some navigators say 16 feet;" and that it is for this reason that he, in his plan of the work, assumed 12 feet for the height of the cribs above the level of the lake, in order to assimilate it nearly to the height of the wave.

In noticing this statement respecting the height of the waves of Lake Michigan, the board cannot refrain from expressing its conviction that it must have been breakers or spray and not waves that were the subjects of observation, and that such a body of water as Lake Michigan is not capable of generating waves equal to those of the Atlantic ocean, or greater than the highest known waves of the Pacific. It has often been remarked that little or no reliance is to be placed upon the casually estimated height of waves, and the present is an example of the truth of the remark. As to the horizontal force which a wave is capable of exerting in a depth of 19 feet of water in Lake Michigan, the only force the effects of which need be feared, the board has no apprehension respecting it. In that depth, the board believes that the movement of the waves will be developed essentially in a vertical sense, and will, therefore, be incapable of overturning the structure. It is of opinion, then, that all the reasoning of the agent, drawn from the idea of a horizontal force exerted by the waves, falls to the ground; and the same may be said of the attempt to assimilate the case of our harbor piers, founded upon a shallow shelving bottom in the midst of the breakers, with the case of a vertical structure founded in water deep enough to permit the free

vertical development of the waves, a depth which the board considered it had attained when it fixed upon the 19-foot curve as the position to be chosen for the proposed work.

As I have already said, the board, while studying this project, had before it Major Turnbull's plan, as drawn upon Mr. Bowes's chart of 1845, and it was well satisfied with that plan. But influenced by a spirit of economy and the actual wants of that locality, and by the considerations which actuated the board in some other cases—considerations drawn from the history of our lake improvements—the board deemed it expedient to present, for the consideration of the department, a project less extensive in the first instance, and therefore less expensive than Major Turnbull's, but capable of future extension.

Regarding the work in the light of a mere harbor for the trade of Michigan City, it deemed it sufficient, with that object in view, to provide shelter only for vessels trading to Michigan City, and for vessels accidentally caught by stress of weather in its vicinity. For this purpose a breakwater, nearly parallel with the shore, as suggested by Major Turnbull's plan, was deemed an essential feature upon the position of this breakwater or its distance from the shore; and upon its length would necessarily depend the amount of shelter to be derived from the work. It is evident that the further the breakwater from the land, the greater must be the length in order to yield a given amount of shelter to vessels lying near the shore. On the other hand, the nearer the shore the less room there would be for vessels to round to in coming to a berth inside of the work.

The board considered it to be an essential condition of the stability of the work that the breakwater should be founded at such a depth as to permit the free vertical development of the greatest waves in that vicinity.

After much consideration and no little discussion, it was assumed as very probable that a depth of 19 or 20 feet would suffice for that condition of the problem, and accordingly the 19-foot curve was taken as the proximate position of the breakwater; and as there are two curves of that depth, an inner and an outer curve, the inner curve was taken, as more consistent with the principles of economy by which the board was, in some degree, influenced in reference to the case, and this curve was the more readily adopted because, in the opinion of the board, this position still left an opening between it and the 12-foot curve to enable vessels seeking the shelter of the harbor to round to very safely.

This opening, according to the chart before the board, (Mr. Bowes's chart of 1845,) was upwards of 500 feet, an entrance greatly exceeding that of any other artificial harbor on the lakes, and, therefore, in the opinion of the board, quite a safe one.

This arrangement enabled the board to reduce the length and consequent cost of the breakwater (yielding an arc of protection equal to that of Major Turnbull's plan) from 2,000 feet to 1,090 feet. Moreover, the board deemed it quite admissible to reduce the profile of the breakwater, for, in its opinion, it is an error to suppose that a vertical work, founded in water deep enough to permit the free development of the waves, requires as strong a profile as does a work founded in shoal

water, and upon a shelving bottom, and exposed to the horizontal force of the breakers.

As has been already intimated in the report, the leading reason influencing the board to assume the inner in preference to the outer 19-foot curve for the line of breakwater was the saving which must necessarily result from the diminished length of the work—a diminution, the consequence of the diminution of the length of the sides of the triangle representing the area of protection afforded by the work. Approximately the value of this saving may be deduced from the following, viz:

The length of the breakwater proposed by the agent, Mr. Bowes, in his report of September 19, 1852, was 2,000 feet, or.....	66 $\frac{2}{3}$ cribs
The length proposed by the Board of Engineers, 1,090 feet, or.....	36 $\frac{1}{3}$ cribs
The length proposed more recently by Lieut. Col. Graham and Mr. Bowes, 1,560 feet, or.....	52 cribs

Which statement may be represented in money value, as follows, viz:

66 $\frac{2}{3}$ cribs founded in 25 feet water would cost, according to Mr. Bowes's estimate.....	\$321,000 00
36 cribs in 19 feet water, \$2,136 30 per crib, according to the board's plan and estimate.....	77,618 00
52 cribs in 19 feet water, and located on the outer 19-foot curve, agreeably to the suggestion of Lieut. Colonel Graham.....	111,087 60

It should be remarked, however, that, judging from a rough inspection of the diagrams, the protected area secured to the shipping by Mr. Bowes's first plan would be more than three times as great as that secured by the board's plan; and, also, that the outer 19-foot curve would give about twice the area of protection as the inner 19-foot curve.

These facts will enable the bureau to select the position the most suitable to its views of the wants and interests of navigation.

Respecting the profile or cross-section of the breakwater, it may be necessary to add a few words to what has already been advanced.

The board, in its report of 1852, proposed 20 feet for the width of the cribs intended for the 19-foot curve, and what has been said upon that point is intended to show that this width should be sufficient to insure the stability of the structure in a depth of 19 feet.

But this opinion is founded upon the hypothesis that the only force to which the work can be exposed is the ordinary force of the waves at that depth. The agent for the work, however, makes us acquainted with a fact not known to the board in 1852, namely, that the ice in that vicinity acts occasionally with great force, and it is necessary to take that fact into view in discussing the question of the cross-section of the cribs. For this reason, therefore, and for others set forth by them, in their reports touching the harbor of Michigan City, the agent and the superintending engineer propose an increase of width for the piers. This suggestion has engaged the attention of the

board, a majority of which are of the opinion that, in view of the occasional presence of floating ice, and their necessary isolation, it may be prudent to give to the two cribs, for the construction of which there is said to be means in hand, a width of twenty-five feet.

Very respectfully, your obedient servant,

JAMES KEARNEY,
Lieut. Col. Top. Engineers, President.

Colonel J. J. ABERT,
Bureau Topographical Engineers.

H 9.

Colonel Graham to Agent Bowes.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, August 11, 1855.

SIR: In accordance with authority received this day from Washington, the cribs for the Michigan City breakwater will be constructed twenty-five feet wide.

Accordingly, they will be built after the plan shown in the drawing marked "case 3d," heretofore forwarded to you from this office, making the interstices or open spaces in the grillage bottom 3 feet 2 inches long by 3 feet wide.

I request that you will return to this office the wood model of a crib sent to you last autumn; also the drawings of crib work, marked "case 1st" and "case 2d," lately sent to you, after having copied the mode of bolting shown in "case 1st." They are now required at some of the other harbor works. They may be sent by express.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieut. Col., Superintending Eng., &c.

JOHN R. BOWES, Esq.,
U. S. Agent, Michigan City, Indiana.

H 10.

Agent Bowes to Colonel Graham.

OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, September 1, 1855.

COLONEL: I have the honor to hereby submit a report of the work done on the breakwater at this harbor for the month of August, viz: Caulking, making new cranes and otherwise repairing an old crane scow, which had been hauled out of the creek in July last; cutting off one end and framing 148 sticks of timber for cross walls and grillage, and boring the same for the bolts; putting together and build-

ing up two cribs, one to 16 feet and the other to 6 feet in height, and fully bolting the same. The first crib has been launched, and to allow it to float out of the creek, a false bottom of light $1\frac{1}{2}$ inch white wood plank has been used. The bottom is so attached by screw bolts as to be easily detached and removed after the crib is floated into the lake. By this arrangement the crib can be raised to 20 feet while inside the creek and floated to its position in the lake ready to be filled with stone, and thereby avoid the danger and extra expense of building it up in the lake. This crib will be raised to 20 feet and ready to float out to its destination in the lake in a few days. All the timber for both cribs, with the exception of ten sticks, are now fully framed and bored.

The force on this work for the past month has been large, and a great amount of work has been done, but the number of mechanics is now reduced for the present month.

The object of so strong a gang was to force the framing to completion, (in order to be enabled to sink the cribs before the equinox,) and then reduce the number of men to what will be sufficient to finish putting the cribs together and sinking the same. The handling of 150 sticks of the cross timbers a second time, from not having the width of the cribs at an earlier day, has caused a considerable increase in the expense of framing.

The first delivery of the stone has been made, also a portion of the second, in all 49 cords, being sufficient to secure the cribs. The contractor, at my desire, will deliver the balance of the stone into the cribs, and thereby save the expense of scowing them.

Most respectfully submitted by your obedient servant,

JOHN R. BOWES,
United States Agent.

Lieut. Col. J. D. GRAHAM,

Sup. Eng. Lake Michigan Works, Chicago, Ill.

H 11.

Colonel Graham to Agent Bowes.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, September 5, 1855.

SIR: Your monthly report of the 1st inst. is received. I infer from your report that you propose to divide the 49 cords of stone now on hand, and to put $24\frac{1}{2}$ cords into each crib for sinking them in their proper positions, and then await the delivery of the balance of the stone to fill the cribs to the level of the water surface. Experience has proved that not less than 49 cords should be put into one crib when sunk in a position exposed to the action of so heavy a sea as the Michigan City breakwater will be.

If less than that quantity is put in at first, the force of the sea in a gale of wind will be sufficient to lift the crib a little each time that the sea strikes it, and each time a portion of the stone will drop

through the interstices in the grillage bottom, and thus, when the crib is again let down by the receding wave, it will find itself forced out of position and tilted out of level by resting on the irregular pile of stones. Do not, therefore, float a crib to its position until you have stone enough delivered to fill it to the water surface or very nearly. I find by the contract with Mr. Bentram that 75 cords are already due, and that the remaining 75 cords will be due by the 20th of the present month.

One of the cribs for the Waukegan breakwater, in the course of being filled with stone, was visited by a gale of wind, which drove off the scows after 27 cords had been deposited in the crib. The weight of these 27 cords was not sufficient to prevent the force of the waves from lifting the windward end of the crib; the consequence was that one end was made to rest three feet higher out of the water than the other, by the stone dropping through the grillage and forming a pile under that end. Had the sea struck the crib on its side it would have put it much out of position.

The breakwater will be located on what was the outer or lakeward curve of 19 feet water when your survey was made, or in 20 feet water at present. My tide-gauge here shows the surface of the lake to be now full one foot higher than it was then.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Eng'r, &c.

JOHN R. BOWES, Esq.,

U. S. Agent, Michigan City, Indiana.

H 12.

Agent Bowes to Colonel Graham.

[Extract.]

OFFICE OF UNITED STATES PUBLIC WORKS,

Michigan City, September 15, 1855.

SIR: I have the honor to inform you that yesterday afternoon we sank the first crib of the breakwater in its position in the lake, and the operation was attended with complete success. Since four o'clock yesterday afternoon, including all last night up to the present time, 2 p. m., we have kept our scows unceasingly in motion in carrying out stone, and we have now 45 cords in the crib, and by 6 p. m. we shall have 55 cords of stone in the crib, enough to keep her perfectly secure from any casualty.

The second crib is in progress, and we hope to have her ready to sink in position in the lake in a short time.

Very respectfully, your obedient servant,

JOHN R. BOWES,

United States Agent.

Lieut. Col. J. D. GRAHAM,

Sup. Eng. Lake Michigan Works, Chicago, Ill.

H 13.

*Report of Agent Bowes to Colonel Graham.*OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, October 1, 1855.

SIR: The operations of this work for the past month (September) have been the framing and dressing the remainder of the timber for the cribs, preparing the second crib for launching and attaching to it a temporary bottom for floating it out of the creek, raising the first crib already launched to twenty feet, floating it out to its location on the outside curve of nineteen-feet bar, (now twenty-feet water,) sinking and filling the same. This crib was sunk on the 14th of September, and filled with seventy cords of stone. The equinoctial gale commenced as soon as it was sunk and filled with stone, not allowing any time to raise it above the water-line. The crib was twenty feet in height, and was sunk in 20 feet of water, as directed; the effect of the gale was to cut out the sand from underneath the crib and settle it about four feet. It settled without any essential difference of level. Since the gale it has been built up to the water-line and well bolted. This crib will have to be filled with an additional quantity of stone, which will be done as fast as they can be scowed. It will be raised six feet above the level of the lake, and decked. The deck is now being prepared, and as soon as a smooth lake will permit, the crib will be raised and the deck put on. The settling of this crib will require more timber and stone than was originally estimated. We shall be obliged to use a portion of the timber that had been framed for the other crib. The sand has been washed from both ends of this crib to a depth of 25 feet water and a length of 20 feet; consequently, the next crib that is sunk will have to be twenty-five feet in altitude to bring it to the water level; and as the quantity of timber on hand was only sufficient for two cribs of twenty-five feet altitude, an additional quantity of timber will be required: first to complete the crib already sunk, viz: 5 additional courses, or 30 sticks, and 5 additional courses on the crib intended to be sunk—in all, 10 courses, or 60 sticks, = 30 longitudinal sticks of 30 feet, and 30 for cross walls of 25 feet, = 1,650 feet of timber, which, at 20 cents per foot, will amount to \$330; also 25 additional cords of stone will be required. Experience has shown that, at no additional cost, the cribs could have been sunk in twenty-five feet of water on clay bottom, as recommended by me in my report to the Board of Engineers. I apprehend no further settling of this crib, as, from all appearances, it has reached the clay. The first object is to finish and properly secure the crib now sunk, and the operation will, in accordance with your instructions, be directed to that object before sinking any more cribs.

Most respectfully submitted by your obedient servant,

JOHN R. BOWES,
*United States Agent.*Lieut. Colonel J. D. GRAHAM,
*Sup'g Eng. Lake Michigan Works,
Chicago, Illinois.*

H 14.

*Agent Bowes to Colonel Graham.*OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, October 5, 1855.

SIR: An unusually heavy blow from the north, which created a tremendous sea, occurred on the 2d instant, by which the crib that was sunk in its position on the line of breakwater on the 14th of September has been broken and driven from its position. It appears, from examination since made, that the force of the sea broke off the crib just above the upper grillage timbers. The upper portion of eighteen feet of the crib became detached from the bottom, and was forced by the sea towards the shore into fourteen feet of water, where it grounded and now lies. To enable you to judge of the force of the waves and their size, I would state that the sea broke in twenty-five feet water; consequently the crib had to sustain the force of a wave of that altitude, impelled by a heavy wind. The whole lake bottom, to this depth, was therefore swept by this wave, and the nineteen feet outside sand-bar, on which the crib was located, was greatly disturbed, causing its sand to move. I presume the loss of this crib may be traced to two causes: first, that the base or width of the crib was not large enough; secondly, to the place of its location, namely, on the crest of a movable sand-bar, instead of being on a clay bottom. The immediate cause of the breaking of the crib near the grillage work may be attributed to a portion of the stone having worked through the grillage and out of the bottom, caused by the undermining of the crib by the undertow. As the crib stood on sand, the undermining must have been great, and have caused the stone to fall into the space made by the above action. By this means the quantity of stone in the crib was reduced, and what remained held the bottom of the crib in its position, leaving the upper portion of the crib without stone to resist the action of the wave, which, acting with great force on the upper portion, caused the separation of the crib.

This crib was built under my special personal supervision and direction. I saw all the timber framed, and every bolt was driven in my presence. It required two men, each with 13-pound sledges, to drive the bolts, which were firmly driven. The plan of the crib in bolting and other particulars was executed in strict conformity with the drawn plan furnished from your office, and nothing in human judgment was wanting to increase the strength of the structure, or to cause an apprehension of its success, except its width of base and place of location, to which causes alone I can attribute its failure.

A structure to stand safely at this point requires to be of extraordinary strength and dimensions, and located on a clay foundation, as, when the wind blows from the north, the largest and heaviest seas known on the lakes are thrown on this shore. The sea at this point is an accumulated wave, caused by wind acting on a line of over 200 miles of lake, and whose force is beyond calculation.

This experimental crib has tested this point. It had in it 75 cords of stone when sunk, and was filled to the water-line, and presented a re-

sistance of 500 tons in weight, and fully demonstrates the necessity of a much larger base and better foundations to make a successful resistance.

Most respectfully submitted by your obedient servant,

JOHN R. BOWES,
United States Agent.

Lieut. Col. J. D. GRAHAM,
Super'g Eng. Lake Michigan Works, Chicago, Illinois.

H 15.

Colonel Graham to Agent Bowes.

OFFICE GENERAL SUPERINTENDENCE, &C.,
Chicago, Illinois, October 6, 1855.

SIR: Your report of the 5th inst. is this day received. I regret very much the disaster to the crib to which it relates.

You will please use every effort to secure and save that portion of the crib which is stranded near the shore, with a view to using it hereafter, if possible, in constructing another crib. Your whole force should be applied to this object just now, in preference to any other description of work. Please report results as soon as practicable.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieut. Col., Superintending Engineer.

JOHN R. BOWES, Esq.,
U. S. Agent, Michigan City, Indiana.

H 16.

Agent Bowes to Colonel Graham.

OFFICE OF UNITED STATES PUBLIC WORKS,
Michigan City, October 18, 1855.

COLONEL: The roughness of the lake has interfered with our work on the stranded crib, but when we could work we have done well. We have saved, thus far, 21 sticks of timber, and have a good prospect of saving the whole.

The crib has to be taken to pieces stick by stick in the lake, as it draws too much water, at present, to float it into the harbor. We are obliged to use heavy iron wedges to separate the timbers. As soon as we get off a sufficient number to permit the crib to float into the harbor, we can readily take it apart.

Most respectfully submitted by your obedient servant,

JOHN R. BOWES.
United States Agent.

Lieut. Col. J. D. GRAHAM,
Supt'g Eng. Lake Michigan Works, Chicago, Illinois.

H 17.

Colonel Graham to Agent Bowes.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, October 20, 1855.

SIR: Your letter of the 18th instant is received, together with the two corrected vouchers, and the quarterly returns of property mentioned therein. From your remarks in regard to the stranded crib, I fear the expense of recovering the timbers from it will be greater than their value. You will please make an estimate of this, for it will not do to persevere if the cost of recovering them proves to be more than they are worth, and be governed accordingly.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieut. Col. Superintending Engineer.

JOHN R. BOWES,
U. S. Agent, Michigan City, Indiana.

P. S.—Report when all is ready to move out the second crib, but do not proceed to do so until further instructions on that point.

J. D. G.

H 18.

Agent Bowes to Colonel Graham.

OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, October 24, 1855.

COLONEL: In regard to the stranded crib the timber saved is worth much more than the labor bestowed upon it. As soon as the lake will permit, the balance of the timber will be secured.

From the lateness of the season, I do not think it would be prudent to attempt the sinking of the second crib this fall. Winter has virtually commenced, and we have already had a fall of snow, and heavy blows for the past three weeks, and the uncertainty of any steady weather would greatly hazard the loss of the second crib while sinking it.

Most respectfully, your obedient servant,

JOHN R. BOWES,
United States Agent.

Lieut. Col. J. D. GRAHAM,
Sup'g Eng. Lake Michigan Works, Chicago, Illinois.

Ex. Doc. 16—24

H 19.

Agent Bowes to Colonel Graham.

OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, October 27, 1855.

COLONEL: Your telegraph was not received in time to give a reply before I received, this morning, your letter of yesterday, propounding similar questions. I thought this answer by mail would be equally acceptable, as you would receive it nearly as soon, and it could be made more in detail.

There have been saved from the stranded crib, up to this date, the following, viz: 16 sticks of longitudinal timber, (30' $\times$ 12" $\times$ 12"), 15 cross-wall timbers, (25' $\times$ 12" $\times$ 12"), making in all 31 sticks, or 855 lineal feet; there have also been saved 124 bolts, equal to 720 lbs. of iron, one inch square. The expenditure made on account of saving the above is about \$64. To save the balance of the crib it will require about five days' work, which can only be done when the lake is quiet. A small gang is only required, and they receive no pay except when at work. All the timber has been repiled in order to have it safely preserved from decay, warping, &c., and, except saving the remaining timbers of the stranded crib, the works are ready to be closed.

I would also observe that the timber saved from the stranded crib is in as good order as it was when originally put into the crib, and its value for another similar structure is worth, as it now is all dressed, at least \$10 per stick, which would amount to \$310. The iron bolts saved amount to 720 lbs., at four cents per lb., equal to \$28 80, making the whole saved equal to \$338 80; deduct the expense of saving, \$64, leaves a profit of \$274 80 by the operation.

Most respectfully, your obedient servant,

JOHN R. BOWES,
United States Agent.

Lieut. Col. J. D. GRAHAM,

Sup'g Eng. Lake Michigan Works, Chicago, Illinois.

H 20.*Agent Bowes to Colonel Graham.*

OFFICE UNITED STATES PUBLIC WORKS,
Michigan City, November 12, 1855.

COLONEL: The active operations on this work closed on the 7th instant, the scows, boats, machinery, and public property, have been safely secured for the winter. All accounts against the work have been liquidated, and the vouchers for the same are hereby enclosed, amounting to \$440 84, leaving a balance due me of \$19 64. The

operations for the past month (October) have been principally confined to saving the timber of the crib, which was broken and stranded in the gale of the 2d of October; which casualty, and the probable causes which occasioned it, were specially reported to you on the 4th October, and as nothing since has occurred to change the opinions then expressed, I would refer you to it for particular information on the subject. In addition to saving the timber above mentioned, all the other timber remaining has been hauled together and carefully piled, so as to prevent its warping and decay. The quantity of material saved from the stranded crib is as follows, viz: longitudinal timbers, 8 sticks, each $30' \times 8'' \times 12''$; longitudinal timbers, 19 sticks, each $30' \times 12'' \times 12''$; cross-walls, 24 sticks, each $25' \times 12'' \times 12''$; iron 1" square bolts, $226 = 5$ lbs. each $= 1,130$ lbs.

Most respectfully submitted by your obedient servant,

JOHN R. BOWES,
United States Agent.

Lieut. Col. J. D. GRAHAM,

Sup'g Eng. Lake Michigan Works, Chicago, Illinois.

H 21.

Statement of the amount of duties collected at the port of Michigan City, State of Indiana, on foreign merchandise, from January 1, 1855, to December 31, 1855; showing, also, the enrolled tonnage of this port on the 31st December, 1855, as appears on the records of the custom-house; and showing the number of arrivals and departures at the port of Michigan City, from March 1, 1855, to December 31, 1855.

Amount of duties received each month, from January 1, 1855, to December 31, 1855.		Enrolled tonnage December 31, 1855.	Number of bargues enrolled.	Number of brigs enrolled.	Number of schooners enrolled.	Number of steamers enrolled.	Number of sloops enrolled.	Number of arrivals and departures at the port of Michigan City, from March 1, 1855, to December 31, 1855.	Tonnage of vessels arriving and departing in said period.	Average number of arrivals and departures daily in said period.	Average amount of tonnage daily arriving and departing in said period.	Remarks.
Months.	Dolls. cts.	Tons. 95ths.										
December 31-----	Nothing-----	-----		1	9			180	8,700	-----	-----	-----

J. D. GRAHAM, Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS, Chicago, December 31, 1855.

Resubmitted, November 15, 1856.

J. D. GRAHAM, Major Top. Engineers, Brevet Lieut. Colonel, &c.

H 22.

Statement of the quantity and value of articles of merchandise received at the port of Michigan City, State of Indiana, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
<i>The following were received by railroad.</i>			
Apples ----- barrels--	3,470	\$2 50	\$8,675 00
Barley ----- bushels--	1,216	1 00	1,216 00
Beans ----- do-----	2,400	1 00	2,400 00
Beef ----- barrels--	1,045	14 00	14,630 00
Beef cattle----- number--	3,089	40 00	123,560 00
Bran ----- bushels--	2,800	10	280 00
Corn ----- do-----	180,828	60	108,496 80
Corn meal----- do-----	2,860	1 50	4,290 00
Dressed hogs----- pounds--	856,000	5½	47,080 00
Flour ----- barrels--	16,307	8 00	130,456 00
Grass seed----- bushels--	972	3 50	3,402 00
Hogs, live ----- number--	4,288	12 00	51,456 00
Horses ----- do-----	1,142	100 00	114,200 00
Lime ----- barrels--	264	1 25	330 00
Lumber ----- M feet--	668	16 00	10,688 00
Malt ----- tons-----	80	50 00	4,000 00
Oats ----- bushels--	17,120	40	6,848 00
Pork ----- barrels--	1,342	15 00	20,130 00
Potatoes ----- bushels--	17,440	1 00	17,440 00
Rye ----- do-----	2,050	1 00	2,050 00
Salt ----- barrels--	280	1 75	490 00
Sheep ----- number--	200	3 00	600 00
Shingles ----- M-----	993	4 00	3,972 00
Coal ----- tons-----	300	8 00	2,400 00
Wheat ----- bushels--	80,149	1 50	120,223 50
Whiskey ----- barrels--	1,072	14 00	15,008 00
Articles of merchandise not included in the above, and consisting of sugar, molasses, bar iron, machinery, goods in boxes, groceries, hardware, household goods, furniture, &c----- tons--	8,677	150 00	1,301,550 00
<i>By lake.</i>			
Merchandise as per last items----- tons--	298	150 00	44,700 00
Coal ----- do-----	50	8 00	400 00
Lime ----- barrels--	3,830	1 25	4,787 50
Lumber ----- M feet--	150	16 00	2,400 00
Salt ----- barrels--	3,816	1 75	6,678 00
Shingles ----- M-----	305	4 00	1,220 00
Tan bark ----- cords--	60	7 00	420 00
Plaster ----- barrels--	441	1 50	661 50
Total -----			2,177,138 30

J. D. GRAHAM,
Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Colonel, &c.

H 23.

Statement of the quantity and value of articles of merchandise shipped from the port of Michigan City, Indiana, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
<i>The following were shipped by railroad.</i>			
Apples ----- barrels	3,000	\$2 50	\$7,500 00
Barley ----- bushels	635	1 00	635 00
Beans ----- do	2,400	1 00	2,400 00
Beef ----- barrels	1,045	14 00	14,630 00
Beef cattle ----- number	3,089	40 00	123,560 00
Corn ----- bushels	172,900	60	103,740 00
Dressed hogs ----- pounds	423,400	5½	23,287 00
Flour ----- barrels	14,758	8 00	118,064 00
Grass seed ----- bushels	1,200	3 50	4,200 00
Hogs, live ----- number	4,288	12 00	51,456 00
Horses ----- do	1,106	100 00	110,600 00
Lime ----- barrels	925	1 25	1,156 25
Lumber ----- M feet	476	16 00	7,616 00
Malt ----- tons	42	50 00	2,100 00
Oats ----- bushels	7,181	40	2,872 40
Plaster ----- barrels	70	1 50	105 00
Pork ----- do	1,342	15 00	20,130 00
Potatoes ----- bushels	11,952	1 00	11,952 00
Salt ----- barrels	558	1 75	976 50
Sheep ----- number	200	3 00	600 00
Shingles ----- M	489	4 00	1,956 00
Wheat ----- bushels	75,573	1 50	113,359 50
Whiskey ----- barrels	1,042	14 00	14,588 00
Wood ----- cords	126	3 00	378 00
Articles of merchandise, not included in the above, and consisting of sugar, molasses, bar iron, machinery, goods in boxes, hardware, household goods, groceries, furniture, &c. ----- tons	6,828½	150 00	1,024,27 00
<i>By lake.</i>			
High wines ----- barrels	334	14 00	4,676 00
Lime ----- do	400	1 25	500 00
Wood ----- cords	1,881	3 00	5,643 00
Total value of merchandise shipped from the port of Michigan City, Indiana, during the year ending December 31, 1855 -----			1,772,955 65

J. D. GRAHAM,

Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

Resubmitted, November 15, 1856.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, &c.

9.—HARBOR OF NEW BUFFALO, MICHIGAN.

The only appropriation that has been made for this improvement is that of 1852, which amounted to the very inadequate sum of \$8,000.

Of this sum there were expenditures in the purchase by contract of materials to the amount of \$4,763 83, as shown in the property returns rendered to the bureau.

The balance was entirely too small for the commencement of any kind of construction towards this improvement, as was stated in my general report No. 73, of April 29, 1855.

This first appropriation seems to have been intended only as a means of collecting a portion of the requisite materials and machinery necessary before beginning the construction, having in view additional appropriations upon which to carry on active operations. No such additional appropriation has, however, been made; consequently, after paying a custodian for the care of the property, and the proportional expenses common to all the works appropriated for, of digesting plans, general office expenses, &c., there remained on the 30th of September, 1856, applicable for this work, \$791 94, which will be required for a new survey much needed here.

It only remains, therefore, in order to give vitality to the work, to complete the appropriations called for by the Board of Engineers, or such annual portion thereof as will justify a beginning.

The estimate of the Board, contained in its report of August 19, 1854, (see Senate Executive Doc. No. 1, of the 2d session of the 33d Congress, part II, page 321,) called for the sum of \$46,805 25.

In that estimate there were 2,208 lineal feet of one foot square pine timber for each crib, or 97,152 feet for the 44 cribs, estimated for at 10 cents per foot. This timber cannot now be obtained hewn for less than 18 cents per foot, delivered.

1. We must, therefore, add for deficiency of estimate under present prices, for pine timber..... \$7,772 16

Forty-two cords of stone per crib, or 1,848 cords for 44 cribs, were estimated for at \$8 per cord. It will now cost \$10 per cord delivered there.

2. Deficiency in estimate for 1,848 cords of stone, at \$2 per cord..... 3,696 00

Only 730 lbs. of round iron (bolt) at $4\frac{1}{2}$ cents per lb. were estimated for per crib; supposing the average height of these cribs to be eight feet to the water level, it will require for that height 2,375 lbs. of bolt iron per crib to make a durable crib.

3. Therefore, a deficiency of 104,500 lbs. of bolt iron for the 44 cribs, at $4\frac{1}{2}$ cents per lb., add the sum of... 4,702 50

The estimate of the Board for carpentry, labor, &c., on each crib is \$150. This part of the work cannot be done at present prices of labor, including superintendence, for less than \$350 per crib

4. Therefore, add for deficiency on this estimate for 44 cribs, at \$200 each..... 8,800 00

Total deficiency in the estimate of the Board, owing to the increased prices of labor, materials, &c.....	\$24,970 66
To which add original estimate.....	46,805 25
Amount of estimate under present prices.....	71,775 91
From which deduct value of materials on hand.....	4,763 83
Amount of appropriation now required.....	67,012 08

The balance of the former appropriation will soon be exhausted, in the completion of a new survey, much needed, of this harbor.

In order to obtain the timely delivery of materials, and the necessary tools and machinery on advantageous terms, I would recommend that one-half of the above sum should be appropriated the first year, or say annually for two years the sum of \$33,506 04.

There is a coast light-house here.

No duties on foreign importations were collected at New Buffalo in the years 1855 or 1856. There is a deputy collector stationed here, this being a port of delivery belonging to Detroit district.

The value of merchandise received at this port in the year 1855 was, as per the accompanying statement, marked I 1.....	\$30,019 50
The value of the exports for the same period was, per the accompanying statement, marked I 2.....	18,878 14

Total value of receipts and exports at New Buffalo, Michigan, in the year 1855.....	48,897 64
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There is a branch railroad to this place, connecting with the Michigan Central and the New Albany and Salem railroads. It is expected that when the harbor improvements are completed here, New Buffalo will divide the export and import trade of these railroads with Michigan City, Indiana.

I 1.

Statement of the quantity and value of articles of merchandise received at the port of New Buffalo, State of Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
The following were received by railroad :			
Corn meal.....tons..	52	\$16 00	\$832 00
Flour.....barrels..	487	8 00	3,896 00
Beans.....bushels..	65	1 50	97 50
Lime.....barrels..	26	1 50	39 00
Pork.....do.....	35	15 00	525 00
Salt.....do.....	60	1 75	105 00
Shingles.....M.....	100	4 00	400 00
Sugar, molasses, goods in boxes, iron, household goods, furniture, machinery, &c.....tons..	158½	150 00	23,775 00
Whiskey.....barrels..	25	14 00	350 00
Total value of merchandise received at the port of New Buffalo, Michigan, during the year ending December 31, 1855.			30,019 50

J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN IRON WORKS,
Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,
Major T. E., Brevet Lieutenant Colonel, &c., &c.

I 2.

Statement of the quantity and value of articles of merchandise shipped from the port of New Buffalo, Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
The following were shipped by rail-road :			
Household furniture, goods, and miscellaneous articles of merch'dise.....tons..	54	\$150 00	\$8,100 00
Barrel staves and bolts.....cords..	86	6 00	516 00
Flour barrels.....number..	1,000	30	300 00
Lumber.....M feet..	86½	16 00	1,384 00
Piles.....number..	210	2 14	449 14
Wagon spokes.....M..	40	12 00	480 00
Square timber.....M feet..	2	120 00	240 00
Wood.....cords..	448	3 00	1,344 00
By lake :			
Wagon hubs.....number..	500	25	125 00
Wagon spokes.....M..	70	12 00	840 00
Wood.....cords..	1,700	3 00	5,100 00
Total value of merchandise shipped from the port of New Buffalo, Michigan, during the year ending December 31, 1855.....			18,878 14

J. D. GRAHAM,

Major T. E., Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,

Major T. E., Brevet Lieut. Colonel, Superintending Engineer.

10.—ST. JOSEPH HARBOR, MICHIGAN.

This harbor is at the mouth of the St. Joseph river, which is one of the boldest and best rivers tributary to Lake Michigan. It runs through the fertile counties of Branch and St. Joseph, in the State of Michigan, then through the counties of Elkhart and St. Joseph, in the State of Indiana, and then again enters the State of Michigan, and runs through the county of Berrien in that State, within which it debouches into Lake Michigan. It waters a country more than 150 miles of lineal extent, rich in agricultural resources, and deeply interested in the improvement of the harbor at its mouth.

This interest extends to both the States of Michigan and Indiana. The great volume of water ejected at its mouth into the lake gives a more than ordinary advantage in keeping the harbor entrance open, when once the piers shall be extended out to a proper distance. These are properties which we think entitle this harbor to particular favor, because they will operate to aid greatly in the object to be accomplished, and thus diminish very much the usual expenses of dredging.

The pier work to form this harbor is in part, perhaps, the oldest of any on this lake. It was begun at a time when there was but little practical experience on the subject, and shows in some of its parts the total inefficiency of cribs that are built thirty feet wide, with cross-ties of round timber, often not more than 8 or 10 inches in diameter, bark and sap included, and without any support at the middle, from a longitudinal wall running midway between the two outside longitudinal walls; seven hundred feet in length of the north pier were originally built in this way.

It required, as we see on inspecting the work now, but a moderate degree of decay in these cross-ties to cause fracture at the middle from their own weight.

Instead of using iron bolts as the chief fastenings of the timbers together, the custom of that period was to depend mostly upon wooden pins, or *treenails*, for this purpose. I have never known an instance where this has been done in structures of this kind that it has not proved poor economy. Experience and observation show that the best and toughest wrought iron is the best and cheapest material for this purpose, and, moreover, that there is economy in the liberal use of it, especially where a pier is exposed to a strong action of the lake waves.

After the cross-ties of this portion of the pier gave way and caused the outer walls to be deranged, thus causing openings which let the sea through, the action of the latter, with the sand driven along by it against these wooden bolts or treenails, has actually worn them away, and destroyed the union of the timbers which they afforded when new; hence, notwithstanding all the patching up of this part of the north pier of this harbor which has been done, the whole of it must now be torn away and new pier-work built in its place.

The estimates we present herewith provides for this measure; the new structure to be 20 feet wide, and in accordance with the drawings in sheet G No. 19,* herewith presented.

* A duplicate of this drawing is in the hand of the Secretary of the Senate, prepared for the engraver. J. D. G.

The remaining portion of the north pier was built 25 feet wide. This lakeward portion is 436 feet long and is in good condition.

The south pier was built 24 feet wide, except one crib of thirty feet in length at its lakeward extremity, which is 25 feet wide. This pier was constructed in the same defective manner as the north pier, and is in a very dilapidated state, so that the sea in high winds makes a breach through it near its junction with the lake shore, and makes a deposit of sand within the harbor. So bad is its condition that a portion of this pier which extends from its angle out to its lakeward extremity must be torn away and a new pier be built. This portion is 350 feet long.

I recommend that a new pier 20 feet wide be constructed on the south side of this one in lieu of the above mentioned portion, and that the said portion of the old one be then torn away.

In my annual report for last year I recommended that the suggestion of Agent J. R. Bowes, which was concurred in by the Board of Engineers,* of an extension of the south pier six hundred feet lakeward from its present terminus should be adopted.

Since the date of that report, however, a new and very accurate survey, minute in every particular, has been made of this harbor. It was done in August, 1856, under the direction of this office, by Assistant John R. Mayer. The accompanying map, marked G No. 47, is projected from that survey.

A duplicate of it will be forwarded as soon as it can be finished for the use of the engraver.

By reference to this map it will be seen that the result of this survey proves that the entrance to St. Joseph's harbor is in much better condition in regard to the depth than has heretofore been supposed.

A draught of not less than twelve feet can be brought entirely in with four hundred feet width of sea room opposite to the extremity of the north pier, and with not less than 250 feet of sea room before the extremity of the south pier is reached.

It does not, then, appear necessary to extend the south pier as much as 600 feet lakeward of its present terminus. An extension of 320 feet will pass the shoal of less than 12 feet of water and reach to that depth, and I would recommend that this should be the limit of said extension until the operations of nature shall show that more is requisite.

The renewal above recommended and this proposed extension will require 670 feet of pier work for the south pier. It will increase the width of the harbors between the piers to 290 feet,† by placing the renewed portion 40 feet to the southward of the present decayed portion. This will allow a space of 15 feet between the old‡ and the new portion, which will be required for the convenience of a passage while the new work is going on. The proposed increased width of channel-way between the piers will be a great convenience to navi-

* See reports at pp. 166 and 167, of part 3d of Senate document No. 1, of the 33d Congress, 1st session. Also p. 258 of part 2d of Senate document No. 1, of the 33d Congress, 2d session.

† The present width between the piers is 250 feet.

‡ The width of the outer crib of this old rotten portion is 25 feet. The width of the new one will be 20 feet.

gators in entering the harbor during certain winds, and the bold current of the river in times of fullness will, we think, fully justify this plan.

It will be seen by the map G No. 47, that owing to the great width of St. Joseph river opposite to and above the town—varying from 750 to 1,200 feet—it is for the most part not more than 5 to 6 feet deep. It will no doubt be necessary at a future day to contract the width of the river here by close piling to extend eastward from the upper end of the United States north pier, say to about 450 feet. The increased velocity of the current will then preserve a sufficient depth of water opposite to the town.

The new pier work required for this harbor will then be as follows, viz:

1. Renewal of a portion of the north pier.....	700 feet.
2. Renewal of a portion of the south pier.....	350 “
3. Extension required to the south pier.....	320 “
Total length of new pier work required.....	1,370 “

This pier work will be in an average depth of 15 feet water. The cribs will, therefore, under the rule of the Board of Topographical Engineers, be 20 feet high, and 20 feet wide.

Upon the above data the following estimate is presented for this work. It amounts to \$22,214 35 less than the estimate of last year, for the reasons that the survey lately completed has caused a reduction of 280 feet in the proposed extension of the south pier, and the action of the sea has swept away a portion of the rotten work of the south pier, so as to diminish our estimates for removing this work, from \$25 to \$20 per lineal foot for the whole.

The following estimate is presented for this work:

1. *Estimated cost of one crib 32 feet long, 20 feet wide, and 20 feet high, according to the drawings in sheet G No. 19,* or case 1st of crib work, except that the iron bolts are to be 30 inches long and arranged as in sheet G No. 20,* or case 2d of crib work, heretofore forwarded.*

For 2,530 lineal feet of pine timber, hewn 1 foot square, at 18 cents per foot.....	\$455 40
For 880 lineal feet of oak timber, hewn 1 foot square, at 22 cents per foot.....	193 60
For 1,462 feet, board measure, of white oak plank, 3 by 8 inches, for flooring, at \$20 per M.....	29 64
For 3,319 lbs. of wrought iron for bolts, 1 inch square, at 4 cents per lb.....	132 76
For 137 lbs. of wrought iron spikes to fasten the flooring to the sleepers, to be $\frac{3}{8}$ by $\frac{3}{8}$ of an inch square, at $7\frac{1}{2}$ cents per lb.....	10 27 $\frac{1}{2}$

* A duplicate of both of these sheets are now in the custody of the Superintendent of Public Printing, or of the Secretary of the Senate, at Washington, ready to be engraved.
J. D. G.

For 63 cords of hard boulder stone for crib ballast, at \$10 per cord.....	\$630 00
Cost of material for 1 crib.....	1,451 68
For carpentry, labor, and superintendence.....	400 00
Sum.....	1,851 68
Add 10 per cent. for contingencies.....	185 16
Estimated cost of one crib.....	2,036 84

2. Then 1,370 lineal feet = $42\frac{2}{3}\frac{6}{2}$ cribs of 32 feet long, which, at \$2,036, 84 each.....	\$87,202 21
3. For tearing away 1,050 feet, lineal, of old pier-work and removing the material, at \$20 per foot.....	21,000 00
4. For a set of meteorological instruments, as per item 6 of estimate A 20,* under the head of Chicago harbor.....	232 50
5. For dredging 5,540 cubic yards of sand near the end of the north pier, at 20 cents per cubic yard.....	1,108 00
Amount of appropriation required for St. Joseph harbor, Michigan.....	109,542 71

The small balance of the former appropriation of 1852 has already been expended in mending the worst places in the old rotten piers, and in making the recent survey of this harbor, shown on map G No. 47.

I would recommend that the above sum of one hundred and nine thousand five hundred and forty-two dollars and seventy-one cents be divided into three annual appropriations, as follows, viz:

1st year.....	\$50,000 00
2d year.....	35,000 00
3d year.....	24,542 71
Total as above.....	109,542 71

The larger appropriations the first and second years are advisable to enable us to procure materials in advance and thus ensure the timely completion of the work.

If this harbor be not promptly attended to it will be soon destroyed by the action of the sea upon it in its present decayed and weak condition.

St. Joseph is a port of delivery for foreign importations, and there is a deputy collector stationed here. The port belongs to the district of Detroit. There is a coast light here. No duties were collected here in the year 1855, nor in 1856.

* It is the same as the estimate marked A 17 in last year's report.

The accompanying statement, marked K 1, shows that the enrolled tonnage belonging to this port on the 31st December, 1855, consisting of one brig and 10 schooners, amounted to 1,300 tons. The number of arrivals and departures during the year 1855 was 1,224. Amount of tonnage which arrived at and departed from this port in 1855 was 134,640 tons. Average number of arrivals per day during the season of open navigation in 1855, 4. Average amount of tonnage arriving and departing per day during the season of open navigation in 1855, 440 tons.

The value of merchandise received at this port in the year 1855, and the enumeration of the articles thereof was, as shown by the accompanying statement, marked K 2.....	\$166,337 75
The value of merchandise shipped from this port in the year 1855 was, as shown by the accompanying statement, marked K 3.....	207,170 00
Total value of imports and exports at St. Joseph in the year 1855.....	<u>373,507 75</u>

The harbor of St. Joseph is, from its position on the lake coast, one of the easiest, for vessels caught in northerly or northeasterly gales, to enter from either the eastern or western coast of Lake Michigan.

Its works ought not to be allowed to go to decay, for the whole commerce of the lakes, as well as the farmers of the counties in Michigan and Indiana, above enumerated, are deeply interested in its preservation.

K 1.

Statement of the amount of duties collected at the port of St. Joseph, State of Michigan, on foreign merchandise, from January 1, 1855, to December 31, 1855; showing also the enrolled tonnage of this port on December 31, 1855, as appears on the records of the custom-house; and showing the number of arrivals and departures at the port of St. Joseph from the 1st March, 1855, to the 31st December, 1855.

Amount of duties received each month, from January 1, 1855, to December 31, 1855.	Enrolled tonnage De- cember 31, 1855.		Number of bargues en- rolled.	Number of brigs en- rolled.	Number of schooners en- rolled.	Number of steamers en- rolled.	Number of sloops en- rolled.	Number of arrivals and departures at the port of St. Joseph from March 1, 1855, to De- cember 31, 1855.	Tonnage of vessels ar- riving and departing in that period.	Average number of ar- rivals and departures daily in said period.	Average amount of ton- nage daily arriving and departing in said period.	Remarks.
	Months.	Dolls. cts.										
	January	Nothing	1,300 00	1	10			1,224	134,640	4	440	There were also 127 arrivals of vessels at this port for re- fuge in cases of storms in the year 1855.
	February	do										
	March	do										
	April	do										
	May	do										
	June	do										
	July	do										
	August	do										
	September	do										
	October	do										
	November	do										
	December	do										

J. D. GRAHAM, Major Top. Engineers, Brevet Lieut. Col., Superintending Engineer.
OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS, Chicago, December 31, 1855.

Resubmitted, November 15, 1856

K 2.

Statement of the quantity and value of articles of merchandise received at the port of St. Joseph, Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Agricultural implements.....			\$800 00
Boots and shoes.....			16,200 00
Coal.....tons.....	30	\$12 00	360 00
Dry goods.....			108,300 00
Drugs and medicines.....			5,000 00
Groceries.....			11,977 00
Ground plaster.....barrels.....	275	1 63	448 25
Hardware and crockery.....			15,000 00
Household furniture.....			2,000 00
Lime, stone.....barrels.....	300	1 25	375 00
Mill and machinery castings.....tons.....	15	95 00	1,425 00
Pig iron.....tons.....	27	45 00	1,215 00
Steam engines.....number.....	5	625 00	3,125 00
Water lime.....barrels.....	50	2 25	112 50
Total.....			166,337 75

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,
Major Top. Eng'rs, Bvt. Lt. Col., Supt'g Eng'r.

K 3.

Statement of the quantity and value of articles of merchandise shipped from the port of St. Joseph, Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....bushels.....	2,000	\$0 75	\$1,500 00
Lumber.....M feet.....	12,860	12 00	154,320 00
Machinery castings.....tons.....	5	95 00	475 00
Peaches.....bushels.....	5,000	1 50	7,500 00
Pork barrels.....number.....	1,100	1 25	1,375 00
Potatoes.....bushels.....	2,000	50	1,000 00
Railroad ties.....M.....	20	250 00	5,000 00
Spokes and staves.....M.....	500	12 00	6,000 00
Wood.....cords.....	10,000	3 00	30,000 00
Total.....			207,170 00

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,
Major Top. Engr's, Bvt. Lt. Col. Supt'g Eng'r.

11.—BLACK LAKE HARBOR, MICHIGAN.

The appropriation having been exhausted for this improvement, no work has been done here since my annual report for last year.

I beg leave to refer here to that report, as presenting my views relative thereto at this time. It is hereto attached.

I will remark that a very accurate survey of this harbor was made under the direction of this office, in September last, by Assistant John R. Mayer. A map, marked G No 48, is now being prepared, to show the result of this survey, and will be forwarded as soon as it can be completed. Such a map has been much needed, of this locality, for some years past. When completed, it will afford valuable information to aid in the revised plans for this work.

“ 11.—*Black Lake harbor, Michigan.*

“The condition of the bridge-wharf, commenced as an auxiliary work to aid in the construction of the piers designed for this improvement, was fully reported upon in my general report, No. 73, of the 29th April, 1855. The small sum which was appropriated in 1852 in behalf of the improvement having been exhausted, the small amount of materials, together with the tools and appliances belonging to the work, were sold in the summer of 1855, and the proceeds accounted for in my accounts rendered through the Topographical Bureau to the Third Auditor of the Treasury Department. Of course no work could be done for this harbor during the season of 1855. A further appropriation is necessary to further operations.

“Should another appropriation be granted, I would particularly recommend that the work be carried on in the manner described in my above mentioned report.*

“The original plan and estimates for this work were digested by John R. Bowes, esq., United States agent, and detailed in his report to the Topographical Bureau of December, 1849. This report was accompanied by a detailed survey or map showing the character of the locality chosen for the proposed piers, and the mode of forming a connexion between them and Black lake, by means of a deep cut through an intervening sand-hill. The estimated cost of the work was \$105,225 78.

“The map of Mr. Bowes, projected from his survey of 1849, shows Black lake to be one of the deepest and most capacious inland roadsteads to be found on the whole coast of Lake Michigan. At present there is but little trade from the country immediately around and back of this lake, for the reason, chiefly, that it is but sparsely settled, and its resources, therefore, are not developed. Another reason, perhaps, of weight is, that the narrow, crooked, and shallow outlet of this lake precludes the entrance of vessels of large size, and renders it difficult even for the smaller vessels. If this difficulty of entrance could be removed, Black lake would be one of the best roadsteads on the great western lake border; indeed, it would be invaluable to our navy in time of war.

“Under these considerations, I may be allowed respectfully to add

* This report has been since printed at pages 158 and 159 of the documents from the War Department, accompanying the President's message to the 34th Congress, 1st session.

my recommendation in favor of the appropriation, and would suggest that there would be economy in granting the amount asked for in three equal annual appropriations, each of \$35,075 26.

“This will allow of the timely delivery of the requisite materials, and also allow the work to be pushed forward with alacrity, which will tend much to economy and to its successful accomplishment on this exposed position.

“The only town situated on this lake is that of Holland, in Ottawa county, Michigan. It is a German settlement, and is composed of very orderly and enterprising people.”

L.

Extract from the report of the Board of Engineers, in regard to the harbor improvements, and estimates therefor, page 311, of part 3d, of documents accompanying the President's message to the 33d Congress, 1st session.

BLACK LAKE HARBOR, MICHIGAN.

The original survey and design for a harbor at this place were made by J. R. Bowes, agent. The latter is dated the 24th October, 1849, and it was approved by the Board of Engineers on 9th of May, 1853; it was adopted by the bureau.

Its general features consisted of a cut 275 feet wide and 10 feet deep through a strip of land which separates the lake from Lake Michigan, and the carrying out of two parallel piers at the distance of 275 feet apart, namely, from a cut into the latter to a depth of 20 feet.

Two sites for the cut and piers were suggested by the agent, and, for reasons given in his report, the one designated by the letters C D on the map accompanying it was preferred by the board.

The cost of carrying out this plan he estimates at \$105,225 78.

Made up as follows :

For excavation.....	\$37,176 80
For 2 solid parallel piers.....	38,015 00
For sheet piling, (for each).....	10,468 00
For labor.....	10,000 00
For contingencies, ten per centum.....	9,565 98
Total amount.....	<u>\$105,225 78</u>

J. D. GRAHAM,

Maj. Top. Eng., Brev. Lieut. Col, Supt'g Eng., &c., &c.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,

Maj. Top. Eng., Brev. Lieut. Col., &c., &c.

12.—GRAND RIVER, MICHIGAN.

In regard to this harbor, I have also to refer to my report of last year, for the reason that everything in relation to it remains in the same situation as then. A new and accurate survey was made of this harbor in October last, under the direction of this office, by Assistant John R. Mayer. He is now engaged in projecting a map, marked G No. 49, from this survey. So soon as it can be completed it will be forwarded. It will contain full and valuable information in regard to the capacity and character of the harbor, whose importance is fully set forth, together with the statistics of the commerce for the year 1855, in the report for that year now resubmitted, as follows, viz :

“12.—*Harbor of Grand Haven, at the mouth of Grand River, Michigan.*

“This harbor is situated at the mouth of one of the most useful rivers to agriculturists and lumber dealers within the State of Michigan. As stated in my general report, No. 73, of April 29, 1855, it is navigable for steamboats as high up as Grand Rapids, 50 miles from its mouth, and for batteaux 100 miles. In regard to the character of this river, I beg leave to refer to the remarks contained in that report.*

“Agent J. R. Bowes made a very satisfactory survey of this locality, and his map thereof, and his estimates for the improvement, were sent to the Topographical Bureau with his report of the 15th of December, 1849.

“His estimate for the improvement, which met the approval of the Board of Engineers and Topographical Bureau, was for the sum of \$162,126.

“No work has yet been commenced here, owing to the inadequacy of the sum appropriated in 1852, which was only \$20,000 ; out of this there have been expended, up to the 31st of December, 1855, in proportional expenses of preparing drawings, &c., and office expenses common to all the works of my district, the sum of \$1,615,20.

“I would recommend to favorable consideration the appropriation of the sum estimated by Agent Bowes for this work, and that it be divided into three annual and equal appropriations of \$54,042.

“Grand Haven is one of the termini of the railroad from Detroit which forms the land portion of the great transportation line projected between Detroit, in Michigan, and Milwaukie, in Wisconsin. The total distance by this line, between Detroit and Milwaukie, is 285 miles. The connexion between Grand Haven and Milwaukie will be by a regular line of steamboats. I will here quote the remarks made in regard to the importance of this line in that part of my report which relates to Milwaukie harbor, as follows, viz :

“ “ This line will give the most direct practicable outlet for produce

* Since printed at pages 155 and 156 of the documents from the War Department which accompanied the President's message to the 34th Congress, 1st session.

sent to Milwaukie, and destined for the eastern markets. It will also give the most direct and the quickest route, and hence the cheapest, for supplying the northern parts of Michigan, Wisconsin, and Minnesota, with dry goods, groceries, and other importations from the Atlantic ports.'

"The distance across Lake Michigan, from Milwaukie to Grand Haven, is 85 miles; this line being on the widest part of this lake.

"Grand Haven is a port of delivery for foreign importations, and belongs to the District of Detroit. A deputy collector of custom duties is stationed here. There is a coast and harbor light-house recently built at the outlet of this river.

"To show the rapid increase of mercantile business at this place within the last five years, we present the accompanying statistics of trade for the years 1851, 1852, 1853, and 1855, marked from M 1 to M 5, inclusive.

"The quantity and value of merchandise shipped from this port, in the year 1851, was, as per accompanying statement, marked M 1, \$393,227 50.

"The quantity and value of merchandise shipped from this port, in the year 1852, was, as per statement marked M 2, \$397,332 75.

"The quantity and value of merchandise shipped from this port, in the year 1853, was, as per statement marked M 3, \$651,770.

"The quantity and value of merchandise shipped from this port, in the year 1855, was, as per statement marked M 5, \$1,200,468.

"The quantity and value of merchandise received at this port, during the year 1855, was, as shown by the accompanying statement, marked M 4, \$1,752,160 14.

"And the total amount of value of receipts at, and shipments from, the port of Grand Haven, Michigan, in the year 1855, as per statements M 4 and M 5, was \$2,952,628 14.

"In round numbers, we may call it *three millions of dollars*, as it is impracticable to obtain an account of *all* articles of commerce received and shipped at any port. The statistics giving every item, as we have done, of which we could obtain positive knowledge, must always fall somewhat short of the facts.

"The line of communication which we have mentioned between Milwaukie and Detroit, *via* Grand Haven, will probably be in operation by the end of the navigable season of the year 1856; and it will have the effect of vastly increasing the amount of business at the port of Grand Haven, provided its harbor be improved so as to facilitate the ready entrance and departure of the first class of lake vessels."

M 1.

Statement of the quantity and value of articles of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1851.

Articles.	Quantity.	Price of each.	Value.
Chairs -----dozen--	105	\$2 50	\$262 50
Cranberries -----barrels--	310	2 00	620 00
Flour -----do-----	17,200	3 50	60,200 00
Half barrels-----number--	100	6 00	600 00
Hemlock bark -----cords--	350	3 00	1,050 00
Lath -----number--	4,500,000	1 50	6,750 00
Leather -----tons--	35	400 00	14,000 00
Lumber -----M feet--	35,600	6 00	213,600 00
Pails -----dozen--	500	2 00	1,000 00
Plaster -----barrels--	4,520	1 25	5,650 00
Pot and pearl ashes-----casks--	268	15 00	4,020 00
Potatoes -----bushels--	1,100	45	495 00
Rags -----tons--	34	29 41	1,000 00
Rakes -----dozen--	150	3 00	450 00
Saleratus-----boxes--	900	5 55	5,000 00
Sash -----bundles--	100	10 00	1,000 00
Shingles -----M-----	13,000	1 25	16,250 00
Shingle bolts -----cords--	650	4 00	2,600 00
Spars -----number--	50	30 00	1,500 00
Staves -----M-----	320	7 81 $\frac{1}{4}$	2,500 00
Stucco -----barrels--	300	4 00	1,200 00
Wagon-hubs -----number--	5,000	30	1,500 00
Wheat -----bushels--	37,800	60	22,680 00
White fish and trout-----barrels--	150	6 00	900 00
Wood -----cords--	1,200	1 50	1,800 00
Wool -----tons--	11	600 00	6,600 00
Furs -----packs--	80	250 00	20,000 0
Total value of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1851-----			393,227 50

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,
Chicago, December 31, 1855.

J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Col., Superintending Engineer.

Resubmitted November 15, 1856.

J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Col., &c., &c.

M. 2.

Statement of the quantity and value of articles of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1852.

Articles.	Quantity.	Price of each.	Value.
Bark ----- cords of...	500	\$3 00	\$1,500 00
Chair bottoms.....dozens of..	132	-----	-----
Chair rounds.....casks of...	20—152	-----	300 00
Cranberries.....barrels of..	40	4 00	160 00
Flour.....do.....	18,550	3 50	64,925 00
Furs and skins.....packs of...	196	100 00	19,600 00
Laths.....M of.....	11,000	1 50	16,500 00
Leather.....rolls of...	475	27 00	12,825 00
Lumber.....M feet of..	31,500	6 00	189,000 00
Maple sugar.....pounds of..	3,000	5	150 00
Pails.....dozens of...	150	2 00	300 00
Plaster.....barrels of..	5,760	1 12½	6,480 00
Rags.....pounds of..	24,084	2½	602 10
Potatoes.....bushels of..	1,000	50	500 00
Salæratus.....boxes, casks, kegs of..	1,238	-----	10,387 70
Sash lights.....number of..	8,000	2½	200 00
Shingles.....M of.....	25,000	1 75	43,750 00
Shingle bolts.....cords of...	300	5 00	1,500 00
Siding machines.....number of..	6	200 00	1,200 00
Staves.....M of.....	450	7 50	3,375 00
Stucco.....barrels of..	550	2 00	1,100 00
Timber.....M feet of..	50	50 00	2,500 00
Tubs.....nests of...	100	2 50	250 00
Wagon-hubs.....number of..	4,600	50	2,300 00
Wheat.....bushels of..	12,000	75	9,000 00
Wood.....cords of...	2,000	1 25	2,500 00
Wool.....pounds of..	46,937	35	16,427 95
Total value of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1852.....	-----	-----	397,332 75

OFFICE GENERAL SUPERINTENDENCE LAKE MICHIGAN WORKS,
Chicago, December 31,1855.
J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Col., Superintending Engineer.
Resubmitted, November 15, 1856.
J. D. GRAHAM,
Major Topographical Engineers, Brevet Lieut. Colonel, &c., &c.

M 3.

Statement of the quantity and value of articles of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1853.

Articles.	Quantity.	Price of each.	Value.
Ashes ----- casks..	72	\$18 00	\$1,296 00
Bedsteads ----- number..	255	2 28	837 00
Cranberries ----- barrels..	35	6 00	210 00
Chair stuff ----- hhds. and bundles..	210	-----	1,110 00
Deer skins ----- bundles..	3	10 00	30 00
Flour ----- barrels..	19,336	5 00	96,680 00
Furs ----- packs and boxes..	72	-----	9,500 00
Grain cradles ----- number..	92	5 00	460 00
Laths ----- M..	13,168	2 00	26,336 00
Leather ----- boxes and rolls..	790	-----	23,910 00
Lumber ----- M feet..	41,000	8 00	328,000 00
Pickets ----- number..	42,775	5 per M.	213 00
Plaster ----- barrels..	6,181	1 25	7,730 00
Rags ----- tons..	27	60 00	1,620 00
Rakes ----- bundles..	100	2 00	200 00
Salæratius ----- tons..	89	97 50	8,670 00
Sheep pelts ----- bundles..	83	10 00	330 00
Shingles ----- M..	33,000	2 25	74,250 00
Shingle bolts ----- cords..	100	10 00	1,000 00
Ship knees ----- number..	501	5 00	2,505 00
Staves ----- do..	248,125	10 per M.	2,481 00
Stucco ----- barrels..	1,200	3 50	4,200 00
Timber ----- M ft..	179	61 25	11,412 00
Tubs ----- number..	4,800	75	3,600 00
Wagon-hubs ----- do..	3,000	25	750 00
Wheat ----- bushels..	17,090	1 00	17,090 00
Wood ----- cords..	950	2 00	1,900 00
Wool ----- bales..	509	50 00	25,450 00
Total -----	-----	-----	651,770 00

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Sup. Eng'r.

Resubmitted November 15, 1856.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieutenant Colonel.

M 4.

Statement of the quantity and value of articles of merchandise received at the port of Grand Haven, State of Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beef ----- barrels--	115	\$17 50	\$2,012 50
Coal ----- tons--	752	10 00	7,520 00
Corn ----- bushels--	5,568	60	3,340 80
Flour ----- barrels--	24,957	8 94	223,115 58
Green apples ----- do--	550	2 50	1,375 00
Head of cattle ----- No--	45	48 00	2,200 00
Hoops ----- M--	20	10 00	200 00
Horses ----- No--	36	100 00	3,600 00
Leather ----- rolls--	2,190	19 00	42,190 00
Oats ----- bushels--	20,593	30	6,177 90
Paper rags ----- pounds--	63,301	4	2,532 04
Pig iron ----- tons--	400	30 00	12,000 00
Plaster ----- barrels--	11,646	1 00	11,646 00
Pork ----- do--	720	20 00	14,400 00
Pressed hay ----- tons--	625	8 00	5,000 00
Saleratus ----- pounds--	68,022	6	4,081 32
Salt ----- barrels--	9,510	2 00	19,020 00
Ship knees ----- No--	285	4 00	1,140 00
Staves ----- M--	304	100 00	30,400 00
Staves ----- bundles--	2,086	47	1,000 00
Steam boilers ----- No--	14	357 00	5,000 00
Steam engines ----- No--	12	1,500 00	18,000 00
Stucco ----- barrels--	6,008	3 50	21,028 00
Threshing machines ----- No--	10	150 00	1,500 00
Merchandise ----- tons--	7,158	150 00	1,073,700 00
Water lime ----- barrels--	606	2 50	1,515 00
Wheat ----- bushels--	78,526	2 00	157,052 00
Whiskey ----- barrels--	890	16 00	14,240 00
Wines and liquors ----- do--	720	41 66 $\frac{2}{3}$	30,000 00
Wood ----- cords--	1,511	2 00	3,022 00
Wool ----- pounds--	95,972	34	32,986 00
Meal ----- bags--	583	2 00	1,166 00
Total value of merchandise received at the port of Grand Haven, Michigan, during the year ending December 31, 1855-----			1,752 160 14

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

J. D. GRAHAM,

Major Top. Eng., Brevet Lieut. Col., Sup'g Engineer.

Resubmitted November 15, 1856.

J. D. GRAHAM,

Major Top. Eng., Brevet Lieut. Col., &c.

M 5.

Statement of the quantity and value of articles of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1835.

Articles.	Quantity.	Price of each.	Value.
Bedsteads.....dozens of..	60	\$25 00	\$1,500 00
Canal boats.....number of..	2	900 00	1,800 00
Flour.....barrels of..	22,807	9 00	205,263 00
Ground feed.....bags of..	447	1 00	447 00
Hemlock bark.....cords of..	500	4 00	2,000 00
Hoops.....M of..	20	10 00	200 00
Laths.....do..	15,000	2 20	33,000 00
Leather.....rolls of..	2,190	19 26½	42,190 00
Lumber.....M feet of..	45,000	10 00	450,000 00
Merchandise.....tons of..	196	459 12½	90,000 00
Pails.....dozens of..	542	2 50	1,355 00
Paper rags.....pounds of..	56,750	4	2,270 00
Plaster.....barrels of..	11,646	1 00	11,646 00
Salæratius.....pounds of..	64,822	6	3,889 00
Sawed staves.....bundles of..	2,086	47	1,000 00
Shingles.....M of..	40,000	2 50	100,000 00
Ship knees.....number of..	250	4 00	1,000 00
Staves.....M of..	304	100 00	30,400 00
Stucco.....barrels of..	6,008	3 50	21,028 00
Timber.....M of..	30	60 00	1,800 00
Tubs.....dozens of..	452	8 85	4,000 00
Wagon-hubs.....number of..	11,470	10	1,147 00
Wagon-spokes.....do..	11,250	10	1,125 00
Wheat.....bushels of..	76,430	2 00	152,860 00
Wood.....cords of..	1,511	2 00	3,022 00
White fish.....half bbls. of..	1,135	4 00	4,540 00
Wool.....pounds of..	65,972	50	32,986 00
Total value of merchandise shipped from the port of Grand Haven, Michigan, during the year ending December 31, 1854.....			1,199,468 00

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

Resubmitted November 15, 1856.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, &c., &c.

FLATS OF ST. CLAIR RIVER, MICHIGAN.

II. LAKE ST. CLAIR HARBOR WORKS.

1.—ST. CLAIR FLATS IMPROVEMENT, MICHIGAN.

A full report was made on this important improvement in my annual report for last year.

The work having been assigned to another district, I am relieved from making a further report upon it. My report of last year will be found printed in Senate (Executive) Document No. 73, of the 34th Congress, 1st session, embracing full statistics of the amount and value of the tonnage and commerce which passed over the flats in 1855. (It is reprinted, as follows, viz:)

Report of the Secretary of War, communicating, in compliance with a resolution of the Senate of the 14th instant, a copy of the report of Lieutenant Colonel Graham, respecting the improvement of the navigation of the flats of St. Clair river.

WAR DEPARTMENT,

Washington, May 19, 1856.

SIR: In compliance with the resolution of the Senate of the 14th instant, I have the honor to transmit herewith a copy of "the report of Lieutenant Colonel Graham, of the topographical engineer corps, respecting the improvement of the navigation of the flats of the St. Clair river."

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

Hon. J. D. BRIGHT,
President pro tem. of the Senate.

No. 138.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, May, 14, 1856.

SIR: I have the honor to transmit to you, herewith, a duplicate of my report on the St. Clair flats improvement, including an account of the operations in relation thereto, to include the year 1855.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,
*Major Top. Eng'rs, Brevet Lieutenant Colonel,
Superintending Engineer.*

Colonel J. J. ABERT,
Chief Topographical Engineers, Washington.

ST. CLAIR FLATS IMPROVEMENT.

Report of Brevet Lieutenant Colonel J. D. Graham, major corps of Topographical Engineers, made to Colonel J. J. Abert, chief Topographical Engineers, on the improvement of the navigation over the St. Clair flats, Michigan, including the operations for that object for the year 1855; and recommending a plan, with estimates, for future operations, together with statistics showing the amount and value of the commerce and navigation which passed over these flats in the year 1855, and the importance of the improvement as a measure of military defence of the national frontier.

The plans for this important improvement were first digested and presented for consideration, by the late and much-lamented Captain Augustus Canfield, of the corps of Topographical Engineers. It was after his death that my command was extended to embrace the Lake St. Clair harbor improvements.

The report of Captain Canfield upon this subject, dated September 1, 1853, will be found in the printed Senate Document No. 1, (executive) of the 33d Congress, first session, part 3d, pages 145 to 150.

The action of the Board of Topographical Engineers thereon will be found in the same volume, pages 208 and 209.

Captain Canfield's examinations and discussions were extended to three separate projects for cutting and preserving a ship-channel through the "Flats" which obstruct the entrance of vessels drawing over six feet of water into the South Pass of the river St. Clair. These were denominated the EASTERN, the MIDDLE, and the WESTERN CHANNEL of the SOUTH PASS. Separate estimates were presented by him, in detail, of the cost of opening a channel twelve feet deep through each of these approaches to the South Pass, both for a width of 300 feet and for one of 600 feet, in each case. He concludes by recommending to preference the adoption of the middle approach or channel to the South Pass, and that it should at first be opened to a width of 300 feet only, and protected on each side by piles one foot square, driven close together. He adds, that the width of channel-way may easily be increased at a future time, should the requirements of navigation demand it.

This project was, after a full examination of the subject by the Board of Engineers, recommended for adoption, and it was adopted by the War Department as the plan of improvement to be carried out. The cost of the improvement, to the extent above mentioned, was estimated by the Board of Engineers at the sum of \$45,000.

This estimate was independent of the cost of a steam-power dredging machine, which had already been constructed out of a previous appropriation. Such were the proceedings in behalf of this proposed improvement before the subject became committed to my attention by the instructions of April 25, 1854.

No appropriation existed then, nor has any been granted since, for carrying on this work. In November, 1854, I inspected the locality, and found the depth of water and the state of the obstructions to nav-

igation very much as they are represented in the survey of Captains Macomb and Canfield, made in November, 1852.* A full report upon this inspection, and upon the condition of the public property appertaining to this improvement, was embraced in my general report, No. 73, to the bureau, of April 29, 1855.

In September, 1854, no appropriation having then been obtained for this work, the Board of Engineers made a second report, with a view, apparently, of reducing the estimates for it, so as to meet the means which it was proposed to raise by private enterprise for carrying it on. This reduction was based upon a proposition to dispense with all structures, (either close piling or crib work,) for the purpose of defending the sides of the proposed cut from being abraded, to the detriment of the channel-way, by the action of ice in winter, or by the wash of the lake waves. This would leave the expense of the dredging alone to be provided for. The estimate for a channel-way 300 feet wide presented by the board, under this modified plan, was for \$27,232; and for a channel-way 600 feet wide under the same system, \$59,663.† Even under this reduced system no appropriation was granted for this work.

I have not anywhere seen a statement, based upon real data, of the extent of the commerce whose prosperity and interests are actually involved in this improvement, and I do not think it has been fully appreciated. A proper understanding of it is essential, however, in connexion with the discussions of the proper capacity and consequent necessary cost of the work. I have, therefore, spared no pains, nor have I begrudged any time, that were necessary in obtaining correct statistics shewing the amount and value of this commerce during the period of navigation of the year 1855. They will be apposite to the discussion of some points which will be most respectfully submitted for consideration in connexion with this subject.

On the opening of the season of navigation in the spring of 1855, the citizens of the chief commercial ports of the western lakes, most interested in the removal of the obstructions to navigation at St. Clair flats, appointed delegates to attend a convention at Buffalo, in the State of New York, to take into consideration the subject of this improvement, and to raise the necessary funds for carrying it into effect, to such an extent, at least, as would relieve them from the most pressing restraints then existing against their navigation and commercial activity. Application was made by the committee for the port of Chicago for authority to use the United States steam-power dredging machine, under the direction and supervision of this office, in aid of the undertaking.‡

This led to the proceedings which are detailed by the accompanying correspondence, to which I beg leave to refer. It will there be seen that the first step to be taken preparatory to commencing the dredging, was to repair the engine of this machine, which had suffered

*See the printed map bound up in part 4th of Senate Doc. No. 1, (Executive,) of the 1st session of the 33d Congress, containing the maps referred to in the reports from the heads of departments, accompanying the President's message of December, 1853.

† See Senate Doc. No. 1, (Executive,) 33d Congress, 2d session, part 2d, pages 327 to 330.

‡ See Colonel Graham's report, No. 74, and document A, thereto attached, to the Topographical Bureau, of May 12, 1855.

somewhat from its having been sunk under water, as stated in my reports Nos. 55 and 73, to the bureau—the first made on the 25th of November, 1854, and the other on the 29th of April, 1855. These repairs were made at the expense of the committee appointed by the delegates to act for them, and the dredging of the middle channel of the South Pass*—or that which had been adopted by the War Department, under the recommendation of the Board of Engineers and Topographical Bureau, as the one to be improved—was commenced the latter part of July, 1855. The work was conducted under the immediate supervision of Frank Williams, esq., civil engineer, of Buffalo, who had been selected by the committee of the delegates to make the examinations of the nature of the work and the estimates for them. He acted under the general direction of this office, and in accordance with the instructions hereto attached, marked N 25.

The dredging was confined to the cutting of the channel C D (see map G No. 34, herewith presented) sixty (60) feet wide, with the design of making it wider on completing the first cut, from 12 feet depth in the lake to the same depth in St. Clair river. The depth of cutting was set at thirteen (13) feet, in order to allow something for a slight filling up from the wash of the lake waves, should such take place.

The dredging was much interrupted by the unusually stormy nature of the season, which has so often been adverted to in preceding parts of this report when treating of the operations at other harbors. From this cause no work of any consequence was done after the termination of the first week of October, although the dredging machine remained in position for work until the 28th day of that month.† The result was, that nineteen thousand five hundred and eighty-nine (19,589) cubic yards of soil were excavated and removed from the proposed channel-way. Although the extent of the improvement, thus produced, was not so great as had been anticipated before the work was begun, yet even this effect was of an appreciable benefit to commerce, because it gave a narrow channel carrying nearly ten feet through it and over the flats, from deeper water in the lake to deeper in St. Clair river. Should it be found on the opening of spring not to have been injured by the wash of the lake waves since the dredging was discontinued, it will be quite practicable during the season of 1856 to give a narrow channel, twelve feet deep, clear over these “flats,” provided the necessary funds are granted by an early appropriation for that object. Such an effect would be hailed as an important era to the commerce of the great lakes.

The nature of the soil to be removed has proved to be more tenacious and more difficult than has heretofore been estimated. Instead of being light sand throughout, to a depth of twelve feet, Mr. Williams reports it “to be of two kinds, viz: on the surface, and to a depth of two to three feet, we find (he says) a clear, coarse sand; below this, there is a deposit of sand and clay, very firm, so that it requires the whole working force of the engine to drive the bucket into it.”—(See report, marked N 26, hereto attached.

* See map G No. 33, herewith submitted.

† See reports marked N 29, N 31, and N 32, hereto attached.

From this experiment I am compelled to increase the estimate for the necessary dredging, in continuation of this improvement, from twelve and a half cents per cubic yard to double that rate.

Mr. Williams informed me that the dredging already done cost at the rate of thirty cents per cubic yard.

The expense of the preliminary preparations, and the stormy nature of the season often interrupting the work, probably enhanced the cost somewhat beyond what it would be in future. I therefore put it in the accompanying estimate, marked N 35, at the rate of twenty-five (25) cents per cubic yard. The number of cubic yards yet to be excavated is 110,133.

This estimate calls for an appropriation for excavating a channel 300 feet wide and 12 feet deep through the middle approach to the South Pass, including the necessary appliances and the requisite repairs of the dredging machine before commencing the work, of \$46,159 07; that is to say, forty-six thousand, one hundred and fifty-nine dollars and seven cents.

The bureau is aware that there is no balance existing applicable to this work, or to contingent expenses relating to it. The above estimate is confined to the last approved plan, (see Docs. N 9 and N 10 hereto attached,) which is limited to dredging only, as the first work to be executed.

I must, however, remark, that I think the opinion of Colonel Abert, chief topographical engineer, expressed in his letter to the War Department of September 30, 1854, in regard to this improvement, is well founded, and ought to prevail, namely:* that it will be necessary to protect the artificial or dredged channel-way by appropriate defensive works, in order to prevent its being filled by deposits of sand that will otherwise be carried into it by the action of the lake waves in rough weather. The report of the Board of Engineers, as I understand it, does not positively reject all protection of the artificial channel-way, but it rather proposes, as a measure of proper economy, to defer it until it shall be shown by experience to be requisite.

Viewing this point as the most important to be investigated in the earliest stage of the improvement, I gave to it all the attention that was in my power to bestow in November last.

While we must admit the justice of the view taken by the board, that it would savor of extravagance to erect these protecting works, provided they can be dispensed with, yet, on the other hand, it should be borne in mind that to open the proposed channel-way will of itself be a costly operation; and unless we guard it as we progress, we may lose its benefits to commerce entirely, together with the money it will have cost. I would therefore respectfully suggest that this point should be regarded as the preliminary first of all to be settled.

On the 13th November ultimo, aided by Captain J. N. Macomb, of the corps of topographical engineers, who very kindly took part in the operation, and furnished the boats and crew belonging to his equipment for the survey of the lakes, I made a close examination and survey of the state of the channel which had been cut out by

* See a copy of this letter, hereto attached, marked N 8.

dredging, between the last of July and the last of October previous. The depth to which it was originally cut, as reported by Mr. Williams, was thirteen (13) feet.

The result of the soundings taken by Captain Macomb and myself, on the 13th of November, is shown on the accompanying map, marked G No. 35. It will there be seen that the depth of a portion of the dredged channel had diminished as much as one and a half to two feet, and that the average diminution throughout was one foot within an average period of thirty-seven days, deducting the portion of October in which no dredging was done.

This diminution was, no doubt, caused by the action of the lake waves on the sandy bottom during the strong gales of wind which prevailed to so great a degree throughout the past summer and autumn. The result indicated by the survey is sufficient, I think, to show the necessity of protecting the artificial channel-way by works of a permanent character, capable of resisting, for an indefinite period, the action of the lake sea. Although this action is not so forcible as upon the great lakes, yet it is one of almost perpetual duration. The sea has here a sweep of eighteen miles throughout four points of the compass, namely, from southeast to south, and of about sixteen miles throughout four points more, namely, from south to southwest. It is true the protecting works will be in shoal water, and close piling of oak timber one foot square, driven at least twelve feet in the soil at bottom, might resist the force of the lake sea in ordinary seasons, and the drifting ice in winter for two or three years; yet there would be but little dependence to be placed upon a structure of this sort for a longer period. The channel, being once opened by dredging, should not be subjected to the vicissitude of being closed or interrupted by breaks in its defences. The immense commerce and navigation looking to a safe outlet here should not be exposed to the probable chances of such disasters.

After having given every attention in my power to the subject, I have respectfully to represent that I do not think the artificial channel, when opened by dredging, can be made secure without the protection of two parallel piers constructed, one on either side of it, in the usual way. I therefore recommend this as the character of the improvement to be adopted. These piers would have a total length of 7,880 feet—that is to say, the pier on the northwest side (see the line A E on map G No. 35) would be 3,880 feet long, and the pier on the opposite or southeast side would be 4,000 feet long. It is recommended that the cribs to form this pier-work should be each twenty feet wide, and seventeen feet high from bottom to the flooring at top, thus making the flooring five feet above the water surface, and that they be constructed in conformity with the drawings given on the accompanying sheet, marked G No. 19, except in regard to the bolting, which should be of round wrought-iron one and a half inch in diameter, and arranged as is shown in sheet G No. 21.

The cut-out channel thus protected would tend to prolong the current from St. Clair river with sufficient velocity to aid greatly in keeping it open.

If it were practicable to perfect the defence of this channel within

a reasonable time by the pier work alone, it would be the more economical plan to do so, and to dispense with close piling altogether. But, considering the amount of work necessary to be accomplished in building the piers, it would occupy at least five and a half years,* with all the activity that could be used during the working seasons.

The immense amount of commerce before alluded to, and which is shown by the accompanying statistics to be dependent upon this channel for its prosperity, ought not to be subjected to so long a delay in securing its practical benefits.

The States of New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, and Wisconsin, and the territory of Minnesota, have their shores washed by the great inland seas, whose intercommunication, by ship navigation, is much interrupted by the want of a safe and sure channel over these flats.

The States of New York, Pennsylvania, Ohio, and a portion of Michigan, on the one side, are crippled in their important commercial relations with the remaining portion of the State of Michigan, and with the States of Indiana, Illinois, and Wisconsin, and the territory of Minnesota, on the other side, by this intervening obstacle. Something would seem, then, under the purview of the Constitution, to be necessary to be done, in order to regulate the commerce between these States. Viewed in this light, the subject becomes one of great public concern.

The value of the articles of commerce and navigation which passed over these flats during the two hundred and thirty days of open navigation, in the year 1855, say between the middle of April and the 1st of December, will be presently shown to have amounted to the immense sum of \$259,721,455 50; that is to say, two hundred and fifty-nine millions seven hundred and twenty-one thousand four hundred and fifty-five dollars and fifty cents. Or, per day, during the navigable season, \$1,129,223 72. The improvement, then, when undertaken, should be executed with a degree of permanency and celerity combined commensurate with its importance and the magnitude of the interests involved.

To accomplish these ends, I would respectfully recommend that the dredging be commenced without delay, and be pushed forward with all possibly energy; that close piling be commenced at the same time and pushed forward on the line B F, (see map G No 35,) so as to afford a temporary protection to that channel as fast as the latter shall progress. In this way a narrow channel of 12 feet in depth, capable of letting the largest class of vessels through, would be opened the first season, together with a protection on the southeast or windward† side, that would prove efficient for at least two and a half or three years.

At the same time, the northwest or leward pier should be com-

* This would be at the rate of 44 to 45 cribs finished and sunk in position in each working season, which is a very large allowance.

† It is not meant by this expression that southeast winds are more prevalent, or that they blow with more force than northeast or northerly winds, but that the effect of southeast winds will be greater upon the work because they have a greater sweep over the lake, while those from the northeast and north are sheltered by the land.

menced and extended on the line A E, (map G No. 35) or perhaps on a line parallel with it and 100 feet more towards the northwest.

To complete this pier would occupy $2\frac{3}{4}$ years. At the end of this period the dredging will have attained a width of 300 feet, with a uniform depth of twelve feet, which is allowing forty thousand cubic yards, as the quantity of this tenacious mixture of sand and stiff soil, that could be excavated in a single season by the use of the single dredging machine now belonging to this work.

Immediately on the completion of the northwest pier, the opposite or southeast pier should be commenced on its appropriate line, for it will then have been decided whether the channel should be limited to a width of 300 feet, or be wider. If 300 feet be fixed on as the limit, the southeast pier will occupy the line of the piling B F, (map G No. 35.)

If a greater width shall be decided on, that pier will be placed so much further to the southeast, and parallel with that line. The piling will, in the latter event, be then removed by either drawing the piles, or cutting them off with a proper machine, even with the bottom of the channel-way.

If this plan were carried out, the following result might be relied on, namely:

1. A channel-way 100 feet wide (considering the dredging already done) and 12 feet deep, capable of letting through the largest class of vessels, together with the close piling on the windward side, and about forty-four cribs, say 1,408 feet in length of the pier on the northwest side, would be accomplished the first season.

2. At the end of the second season 44 additional cribs would be attached to the northwest pier, making its length 2,816 feet, and the 12 feet channel would be widened to 200 feet.

3. During the third season the northwest pier would be finished by adding 33 cribs, (29 of which would be each 32 feet long, and the remaining 4 would be each 34 feet long,) and the 12 feet channel would be increased to a width of 300 feet. Besides which, 11 cribs would be built and placed on the line of the southeast pier, giving it a length of 352 feet.

4. During the fourth season 44 cribs would be added to the southeast pier, making it 1,760 feet long, and the 12 feet channel would be widened to 400 feet, if required, by the conditions of the approved plan.

5. At the end of the fifth season the southeast pier would, by the addition of 45 cribs, have a length of 3,200 feet, and the 12 feet channel would, if required, have a width of 500 feet.

6. By the middle of the sixth season the southeast pier would be finished to its required length of 4,000 feet, and at the end of that season the full width of 600 feet of channel-way would be accomplished, having a uniform depth of 12 feet.

The only difference in cost between a width of 300 and 600 feet for the channel-way would be \$27,533 25, arising from the double quantity of dredging.—(See the concluding remarks in estimate N 35.)

I would respectfully suggest that more exact information than we now possess should be obtained respecting the probable ratio of in-

crease of navigation in future years, and the actual velocity of the current ejected from the mouth of St. Clair river, before deciding upon this question of width. It can be obtained on the opening of the ensuing season of navigation early enough not to delay in the least the commencement of the work on either plan. There is no doubt that a width of 300 feet is quite sufficient for the commerce of this day, but the vast increase of trade within the last five years, indicated by accompanying statistics, combined with the fact that not one-fifth of the agricultural resources of the country which gives birth to this trade are yet developed, admonishes us to study this question of statistics and the hydraulic force of the river before we undertake to reject the greater width of 600 feet. It is very important, if consistent with the elements, that an artificial channel-way should be secured that will admit the passage of vessels with safety at night; otherwise, the detention to active commerce passing here will be seriously felt. The necessary beacons to aid in this night navigation have been well digested and presented by the late Captain Canfield, of the corps, and may be considered as well settled.*

I imagine an important question to arise in the mind of those interested in this improvement upon a plan as economical, as to cost, as may be consistent with efficiency. It is as follows: Why will not the close piling, with oak timber one foot square, be sufficient to protect permanently the sides of the artificial channel-way, and thus save the expense of the pier work?

The importance of this question has been constantly before us in our examinations of the locality and while studying the nature of the improvement.

We have endeavored to digest it well in our own mind, and we are satisfied that the close piling would be destroyed, or so much injured in the course of three or four years by the action of the drifting ice in winter, that the channel-way would be liable to frequent obstructions altogether inadmissible in so important a line of commerce; the expenses of dredging would also have to be frequently repeated.

COST OF THE WORK.

Estimates, in detail, of the cost of the work are herewith presented, as follows:

I.—For a channel-way 300 feet wide, and 12 feet deep, and 3,940 feet long;

1. Dredging, as per estimate marked N 35.....	\$46,159 07
2. For close piling, to protect the south-east side of the dredged channel-way† while the building of the piers is progressing, as per estimate marked N 36 B.....	64,469 93

* See Captain Canfield's report to Colonel Abert, chief topographical engineer, of September 1, 1853, and the maps and drawings accompanying it, published with the documents sent with the President's message to the 1st session of the 33d Congress, December 7, 1853, parts 3d and 4th.

† Another estimate, marked N 36 A, is also herewith presented, showing what would be the cost of two parallel rows of close piling, one on each side of the artificial channel-way, amounting to the sum of \$93,837 21.

3. For two parallel piers as a permanent protection to the channel-way, the one 3,880 feet, and the other 4,000 feet long, estimate N 37..... \$391,829 43

Amount required for a channel-way 300 feet wide... 502,458 43

II.—For a channel-way 600 feet wide, and in all other respects like the above :

1. Dredging, as per the remark in the closing part of estimate N 35..... \$76,692 32
 2. Close piling on the southeast side of the channel-way, as before..... 64,469 93
 3. For the two piers, as before..... 391,829 43

Amount required for a channel-way 600 feet wide... 532,991 68

That is to say, five hundred and thirty-two thousand nine hundred and ninety-one dollars and sixty-eight cents.

I recommend that this last mentioned sum be asked for in behalf of this important work, and I will proceed to submit my reasons.

They are based on,

I. *The annual amount of commerce and navigation requiring a free passage over St Clair flats*

When the subject of this improvement was committed to my attention, all the elements involved in the proper solution of the problem, and estimates of its cost, had been well considered and brought into the discussion except one, and that a very important one, namely : The annual amount of commerce and navigation requiring aid by the improvement. I had sought information of many practical men on this point, but got only vague and unsatisfactory estimates, founded on inadequate data, varying from twenty to fifty millions of dollars.

It appeared important that the matter should be carefully investigated, especially as it was one involving the interests, both agricultural and commercial, of so many States of the Union. Besides those States named, Iowa, and a part of Missouri are interested in it, because the farmers of these States send annually a considerable amount of grain over this route to the eastern Atlantic markets.*

I therefore determined to send an assistant to the principal lake ports to obtain from the custom-house, warehouse, and mercantile books, the actual statistics of the commerce and navigation of these ports, respectively, which passed over St. Clair flats during the season of navigation in the year 1855. That season may be considered as having opened on the 10th of April, and as having closed on the 6th of December, 1855, making its duration 230 days.

The result of these investigations will be found in the accompanying statements marked from N 38 to N 52, inclusive. They embrace the ports of Buffalo, Oswego, and Ogdensburg, in the State of New

* Nebraska and a large portion of Kansas will also be much interested in this improvement, when their agricultural resources shall become developed. Most of their grain will go over his route to the eastern Atlantic markets.

York ; Erie, in the State of Pennsylvania ; Cleveland and Toledo, in the State of Ohio ; Detroit, in the State of Michigan ; Chicago, in the State of Illinois ; and Milwaukie, in the State of Wisconsin. The items appertaining to the other ports on Lake Michigan are absorbed in the statements under the above mentioned heads, and care has been taken not to count the same items twice, under the varying heads of "imports" and "exports" or "receipts" and "shipments." For instance, having obtained at Chicago and Milwaukie the amount of the trade, both by imports and exports, with the port of Buffalo, on going to Buffalo to obtain the statistics there, the articles which came from or went to Chicago and Milwaukie were left out of the count under the Buffalo head, and so on, throughout ; what was once counted as imports or exports from one port to another, was not again counted under the reverse title, on going to that other port.

This investigation of the amount of commerce and navigation over St. Clair flats for the year 1855 has involved of itself a close examination and analysis of eighty-five thousand two hundred and forty (85,240) pages of large folio counting-house manuscript books, besides twenty-one thousand eight hundred and thirty-four (21,834) ship masters' manifests. Not a quantity has been introduced into our aggregates that has not been thus obtained from actual data. My assistant in this great labor was Captain Edward Kelly, of Chicago, who performed his duties in a faithful and highly satisfactory manner. All his returns were critically reviewed, under my immediate supervision, in this office, and approved.

The following results are shown :

1. The value of enumerated articles of merchandise received at the port of Chicago, Illinois, which passed over St. Clair flats in the year 1855 was, as per accompanying statement, marked N 38..... \$91,771,717 98
2. Value of enumerated articles of merchandise shipped from the port of Chicago, Illinois, which passed over St. Clair flats in the year 1855, (statement N 39)..... 21,928,530 91
3. Value of enumerated articles of merchandise received at the port of Milwaukie, Wisconsin, which passed over St. Clair flats in the year 1855, and not included in any preceding enumeration, (as per statement marked N 40)..... 14,065,507 08
4. Value of enumerated articles of merchandise shipped from the port of Milwaukie, Wisconsin, which passed over St. Clair flats in the year 1855, not included in any preceding enumeration, (see statement N 41)..... 8,738,936 75
5. Value of enumerated articles of merchandise received at the port of Detroit, Michigan, which passed over St. Clair flats in the year 1855, not included in any of the above enumerations (see statement marked N 42)..... 676,764 50
6. Value of enumerated articles of merchandise shipped from Detroit, Michigan, which passed

over St. Clair flats in 1855, not included in any preceding enumeration, (see statement marked N 43).....	\$21,605,626 00
7. Value of enumerated articles received at Toledo, Ohio, which passed over St. Clair flats in 1855, not before enumerated, (see statement marked N 44)*.....	145,325 00
8. Value of enumerated articles received at the port of Cleveland, Ohio which passed over St. Clair flats in 1855, not enumerated before, (see statement N 45).....	2,354,683 50
9. Value of enumerated articles shipped from Cleveland, Ohio, which passed over St. Clair flats in 1855, not before enumerated, (see statement marked N 46).....	†9,247,812 15
10. Value of coal (32,391 tons) shipped from the port of Erie, Pennsylvania, which passed over St. Clair flats in 1855, not before enumerated, (see statement N 47.).....	161,955 00
11. Value of enumerated articles received at the port of Buffalo, State of New York, which passed over St. Clair flats in 1855, not before enumerated, (see statement N 48).....	2,867,407 10
12. Value of merchandise shipped from the port of Buffalo, New York, which passed over St. Clair flats in 1855, not before enumerated, (see statement N 49).....	76,560,000 00
13. Value of enumerated articles of merchandise received at the port of Oswego, New York, which passed over St. Clair flats in 1855, not before enumerated, (see statement N 50).....	19,200 00
14. Value of lumber (497 M feet of) received at the port of Ogdensburg, New York, which passed over St. Clair flats in 1855, not before enumerated, (see statement N 51).....	9,940 00
15. Value of merchandise shipped from the port of Ogdensburg, New York, which passed over St. Clair flats in 1855, not before enumerated, (see statement N 52).....	1,614,300 00
Total value of merchandise and agricultural produce known to have passed over St. Clair flats during the 230 days of navigation in 1855.....	251,167,705 97
Or, per day, during the season of navigation, in 1855	1,092,033 50

* The books at Toledo showed no shipments from that port, over St. Clair flats, that were not included in receipts stated at other enumerated ports

† It was impossible, without devoting a very long time to examine various records at Cleveland, to get an accurate statement of all the shipments over St. Clair flats from that port in 1855. The list contained in statement N 46 falls far short of the whole. It is believed that the value of articles shipped from Cleveland, Ohio, that went over St. Clair flats in the year 1855, was full fifteen millions of dollars (15,000 00). We, however, limit our valuation, introduced into our aggregate, to what was actually obtained from authentic records although we know they were not complete.

It is shown by the foregoing facts that the cost of the improvement, according to the plan above recommended, and for a channel-way full six hundred feet wide, will be less than the average value of merchandise and agricultural produce which passed over St. Clair flats during each half day of the navigable season of the year 1855.

It is making no more than a reasonable allowance, for the effect of the obstruction to commerce now existing at St. Clair flats, to say that had that obstruction not existed, the value of the merchandise and produce that would have passed in 1855 would have been full fifty per cent. more than it actually was, or that it would have amounted during the navigable season of 1855 to \$376,751,558 95. This would have been an average value per day of \$1,638,050 25, or per day more than three times the estimated cost of the work, to be done in a permanent manner, and with a channel-way six hundred feet wide and full twelve feet deep.

It should be borne in mind that such a channel would admit as free and safe a navigation at night as during the day. In the present state of the flats no navigator ever thinks of attempting to pass them, except by daylight. This cause of detention, added to that of vessels grounding during their attempts at a day passage, and remaining aground, often for several days, before they can be got afloat and tugged over, actually shortens the navigable season to quite one half of what it will be when the improvement shall be completed, in the manner that shall best obviate all the difficulties.

In drawing our comparisons between the relative cost and the benefits to be derived from this improvement, if accomplished in a permanent manner, we have, so far, confined our estimate of the benefits to an exhibit of the amount and value of the merchandise and agricultural produce which passed over these "flats" in the year 1855; or, in other words, to the amount of capital invested in these commercial commodities. But there is still another species of capital of great value, which is equally involved and equally interested in this improvement. It appertains also to all the States already enumerated as bordering on these great lakes. We allude to the tonnage, or shipping, which is constantly employed in carrying those commercial and agricultural commodities over St. Clair flats. The capital invested in this kind of property is as much entitled to consideration and protection as the other two.

We, therefore, present an analysis of it, as far as we have been enabled to obtain it from actual data. We are, however, aware that this presentation falls short of its full amount, because some of the lesser ports on the lakes, engaged in shipping over the flats, could not, for want of time, be visited in order to obtain their commercial statistics.

The amount and value of the tonnage which was thus employed during the navigable season of the year 1855 is shewn, as far as could with certainty be ascertained, by the accompanying statements, marked from N 53 to N 70.

Statement N 53 is an exhibit of the tonnage of each of the districts of Chicago, Milwaukie, Detroit, Cleveland, Buffalo, Oswego and Ogdensburg, New York, employed in trading over St. Clair flats,

and showing the valuation or actual cost of building and equipping the said vessels.

The aggregate tonnage of these vessels amounts to (N 53).....	195,375 tons.
The first cost of these vessels and their equipment amounts to.....	\$8,553,750 00
This sum added to the value of merchandise and agricultural produce before given, viz:	251,167,705 50
Shows the amount of capital invested in commerce and navigation, which passed over to St. Clair flats in the year 1855, to have been.....	259,721,455 00

Statement N 54 shows that the amount which accrued on freights of merchandise and agricultural produce shipped over St. Clair flats in American vessels in the year 1855, was \$13,761,840 00.

And in foreign vessels trading with American ports \$551,256 00.

These results are derived by allowing six dollars per *register* ton as the price of freights upon the amounts of tonnage that passed over the flats to and from the ports mentioned in the districts of Chicago, Milwaukie, Detroit, Cleveland, Buffalo, Oswego and Ogdensburg, as shewn in the accompanying statements marked from N 55 to N 70 inclusive. These sums are, of course, the gross amounts of the receipts accruing on freights.

The nett proceeds would be the difference between these sums and the expenses of navigation, such as the hire of crews, insurance on the vessels, repairs, tugging off St. Clair flats when aground, losses from detention while thus aground, pilotage, harbor fees, &c.

Among these enumerated expenses, that which arises from the detention, damage, and towage by steam tugs, caused by the obstruction to navigation at the flats, is the one regarded as the most onerous by the navigators, the merchants and the farmers of the nine States and one territory before mentioned.* They all have to bear a portion of the additional charges which arise from this cause. The farmer has, however, the most oppressive part of the burden to bear, because the navigator clears himself in a great measure by his increased charges for freight, and the merchant by increasing his prices at retail on account of the losses by the detention and risk growing out of this obstruction to navigation. But the farmer is compelled to be governed by current prices for his grain, and the diminution of price allowed him by the shipper, on account of the contingencies due to the want of free navigation over the flats, is a direct tax on the fruits of the farmer's industry.

The increase on the rates of freights owing to the obstructions, as it now exists, may be estimated at full fifteen (15) per cent., or annually to the sum of \$2,064,276. Full two-thirds of this amount falls on the farmers.† They may therefore be said to pay an annual tax

* The States of New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Iowa and Missouri, and the territory of Minnesota.

† It will be remembered that the farmer is burdened in a two-fold capacity, viz: first, as a producer; and, second, as a consumer.

on their produce and necessary articles of consumption, arising from this obstruction, of \$1,376,184; which is more than two and a half times the estimated cost of the work upon the most extended plan proposed.

We have endeavored, in the foregoing remarks, to show the great importance of this improvement to the agricultural, commercial, and shipping interests of a very considerable portion of the people of the United States. The estimate which we present of its cost, upon a safe and durable plan, compared with the amount and value of the commerce which daily demands an easy passage over this great thoroughfare of trade, shows how small the sum required for its accomplishment is, in comparison with the interests involved, and the benefits to be derived from it when completed.

But there is still another and a far more important feature which attaches to this improvement, giving it a peculiar claim to attention. It is—

II. *The importance of improving the channel over St. Clair flats, viewed as a necessary element in the military defence of the national frontier.*

War is a calamity which every wise statesman and every good citizen will, by all rightful means, endeavor to eschew. But it is an evil not always to be avoided; and when it comes, it is not unfrequently when least expected. It certainly ought not to be when a nation is unprepared for it. The history of all ages shows that preparation is one of the surest means of prevention, as well as of success, if it come.

This peaceful remedy is peculiarly applicable to our extended northern frontier, stretching over a length of twelve hundred miles of ship navigation through the great lakes. Since the opening of the Saut St. Marie canal, the only obstacle to the co-operation of armed fleets, which, in time of war, would be placed upon Lakes Superior, Michigan, and Huron, with that which would be on lake Erie, is at St. Clair flats.

That obstacle removed, and a depth of channel of twelve feet* obtained there, war steamers of the largest class which would probably be placed on these lakes would have a free navigation from Buffalo, at the foot of Lake Erie, to Fon du Lac of Lake Superior.

The locks of the Saut St. Marie canal now admit the passage of vessels of full fifteen feet draught at the highest stage of water, and twelve feet at the lowest stage.

It would be very important that these naval fleets should have the power of concentration, either wholly or in part, at certain important points now rendered impracticable by these intervening flats.

It would, no doubt, often be important as a measure of naval tactics alone. It would as often, again, be equally necessary in co-operation with our land forces. It might even become necessary, and no doubt often would, under the various vicissitudes attendant on war, to

* The depth may be easily be increased to 16 or 18 feet, by dredging, should war steamers of that draught be required on the lakes

depend on the navy to transport our land forces rapidly from one point to another on different sides of the flats. Any enemy, through the secret emissaries and spies who are always used in times of war, designing a rapid movement in order to concentrate and operate with force upon a given point against us, would find but little difficulty in favoring his scheme by causing a few rods of our railroads to be torn up at several different points, and thus prevent a counter movement, on our part, by land. Our only alternative, then, would be to move by water through the aid of our armed ships. The movements of this sort would not unfrequently be over the St. Clair flats, if they afforded a sufficient depth of channel.

In default of such a channel, the delay and exposure to the attack of a land force, incident to a landing, the making of a short march, and a re-embarcation, would have to be encountered. Such a vicissitude would sometimes be sufficient to cause the defeat of the party which otherwise would be victorious. It might, indeed, be the means of transferring to the enemy the mastery on an important line of operations during a whole campaign, or during the war.

When a work like this subserves the double purpose of military defence in times of war, and of promoting the interests of commerce between several of the States of the Union in time of peace, it would seem to have an increased claim on the attention of the general government. If any work of improvement can be considered national in its character, the improvement of St. Clair flats in the manner proposed may, it is submitted, justly claim to be placed in that category.

Respectfully submitted.

J. D. GRAHAM,

*Major Topographical Engineers, Brevet Lieutenant Colonel,
Superintending Engineer, &c., &c.*

N 1.

Order assigning Lieutenant Colonel Graham to the direction of the St. Clair flats improvement and other works on Lake St. Clair.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, April 25, 1854.

SIR: Your superintendence is by order of the Secretary of War extended so as to embrace the United States duties which were under the late Captain Canfield, namely:

1. Certain operations in reference to the improvement of the channel at the St. Clair flats, Lake St. Clair.
2. Certain operations in reference to light-house structures at the same locality.
3. Certain operations in reference to Port Clinton, Lake St. Clair.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Lieutenant Colonel J. D. GRAHAM,

Corps Topographical Engineers, Chicago, Illinois.

N 2.

Colonel Graham to Colonel Abert.

[No. 74.]

OFFICE GENERAL SUPERINTENDENCE, ETC.,

Chicago, May 12, 1855.

SIR: I have the honor to submit to the bureau the accompanying copy, marked A, of a communication lately received at this office from Messrs. G. W. Rounds, B. S. Shepard, and James Peck, delegates from the Board of Trade of Chicago, appointed to co-operate with those appointed at other cities on the western lakes to devise means, through private subscriptions, for deepening a channel between Lake St. Clair and St. Clair river, so as to relieve the extensive commerce which is obliged to pass over the St. Clair flats, from the great detention to which it is now subjected, owing to the shallowness of the water.

This delegation asks for the use of the United States steam dredge boat, now at Detroit, in aid of the undertaking, on conditions specified in their letter, which induce me to recommend that their request be granted by the department. In my No. 73, I reported to you the present condition of the engine of the dredge, from having been sunk before it came under my custody, and the necessity of immediate repairs. The delegates offer to put the vessel in repair, free of expense to the United States, if permitted to use it under my direction as the government superintending engineer. I explained to them that I should put an agent of my own selection in charge of it, while operating, with written instructions how to use it, he to be responsible to me, but to be paid for his services by them. To this they cheerfully assented. We have no public funds that can well be spared, even if applicable, for making these repairs, and the longer they are deferred the more the engine will deteriorate. The dredge will not be required for use at Clinton river before the latter part of July, or early part of August, and by that time the dredging on St. Clair flats will have been completed, so that if the application be granted it will result in a mutual advantage to this private and laudable enterprise, and to the government operations at the mouth of Clinton river. During my inspection of the "flats" in November last, I witnessed the unfortunate spectacle of a complete barricade of the best channel by the great number of vessels that were aground, thus preventing others of lighter draught from passing, from want of room. I saw, at one time, the masts of 60 or 70 vessels, all detained at the same time from this cause. I estimated that the loss to the shippers and producers from this sole cause, during the last year, to be over half a million of dollars. I believe the enterprise now about to be undertaken will afford great relief if the use of the United States dredge be granted under the conditions specified, which I respectfully recommend to favorable consideration. I am, very respectfully, your obedient servant,

J. D. GRAHAM,

*Maj. Top. Engineers, Bvt. Lieut. Col.,**Superintending Engineer, &c., &c.*Colonel J. J. ABERT, *Chief Top. Engineers, Washington.*

A.

[Accompanying the preceding, marked N 2.]

CHICAGO, April 27, 1855.

SIR: The undersigned were appointed by the Board of Trade of this city as delegates to attend a convention held in the city of Buffalo on the 18th instant, to take into consideration the immediate improvement of the St. Clair flats by private enterprise.

At that convention most of our lake cities were represented, and funds are pledged, and committees appointed to proceed at once with the work. An engineer has been dispatched, and will in a few days furnish us with his views and estimates of the most favorable channel for us to improve, and where the least expenditure of time and money will afford us the desired depth of water. The remoteness of the flats, and the great hazard and expense of procuring dredges and getting them on the spot, induces us to solicit permission from you, or your influence in obtaining from the department, permission to allow us, at our own expense, to proceed at once to put the United States dredge now lying at Detroit in repair, and to use the same under your direction, in deepening which ever channel across said flats shall be deemed most available by the surveyor now on the ground, and the committee who will have charge of the work; our object being to afford the most speedy relief to the restraints now imposed upon our greatly increasing commerce by the obstructions at that point.

And we would respectfully solicit your attention to this matter, and your earnest co-operation with us to enable us to make the desired improvement with as little delay as possible.

We are sir, with much respect, your obedient servants,

G. W. ROUNDS,

B. S. SHEPARD,

JAMES PECK,

Committee.

Colonel J. D. GRAHAM,

Superintending Engineer, &c., Chicago, Illinois.

N 3.

Colonel Abert to Colonel Graham.

BUREAU OF TOPOGRAPHICAL ENGINEERS,

Washington, May 18, 1855.

SIR: Your letter, No. 74, in relation to the use of the United States dredge boat at Detroit, upon the St. Clair flats, having been duly considered, I have the honor to transmit copies of a correspondence on that subject with General Cass and others.*

This correspondence lays down the following principles:

1st. The boat can be so used.

* These documents are hereto attached, marked N 4 to N 13 inclusive.

2d The conditions of its use are, that parties interested shall be at the expense of putting the boat in good order, making all required repairs, of keeping the boat in good order, and of using the boat.

That the boat is not to be taken from the direction and control of the United States superintending engineer.

That the plan of operations is to be the same as the plan recommended by the United States board of engineers, and as approved by the War Department, which has been communicated; of all which you will be more fully informed by the enclosed copies.

It is considered proper that you should repair to Detroit, in order to consummate these arrangements, making full report thereof to this office.

It is not considered necessary to submit the matter again to the War Department, unless you should consider that any part of the proposed arrangement should be dispensed with or modified.

Captain Macomb, to whom the report and plan of the St. Clair flats was sent, is directed to hold them subject to your orders.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Top. Eng.

Major J. D. GRAHAM,
*Corps Top. Eng., Bvt. Lieut. Col. U. S. A.,
Chicago, Illinois.*

N 4.

Colonel Abert to the Hon. Secretary of War.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, September 22, 1854.

SIR: I have the honor to acknowledge your direction to report upon a letter from the Hon. Lewis Cass of the 16th instant.

This letter states that a "committee on behalf of persons interested in the navigation of these lakes" desire permission to use the United States dredge boat built for the purpose of deepening the channel over the St. Clair flats; that these persons are responsible; will do the work at their own expense, and will return the boat in good order. General Cass states, "these applicants are business men of character and responsibility, and will make good all their assurances. I should have no hesitation, were it deemed necessary, to become their security for that purpose." No objection occurs to this office to loan the boat as desired upon the conditions that:

1st. The United States shall be at no expense for preparing the boat for use, and for taking said boat to the locality of the flats.

2d. That the persons to whom said boat is loaned shall be responsible for her safety, and shall return said boat in good order when required.

3d. That the return of said boat shall not be required in less than forty days after said boat shall be received, but said persons, to whom

the said boat shall be loaned shall be responsible for her safety and for her safe keeping, until required to return said boat, which latter period shall not exceed six months after said boat shall have been loaned.

4th. That the said boat shall be employed at the lake St. Clair flats, and on the improvement of such channel as shall be designated by the approved plan of the War Department.

5th. That if required the War Department shall send an officer to mark out the channel to be improved.

The board of engineers upon lake harbors and western rivers has now in hand the preparation of a final report upon the improvement of the St. Clair flats, and the said board, having read this communication, authorizes me to say that it accords with this report.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Top. Eng.

Hon. JEFFERSON DAVIS,
Secretary of War.

N 5.

Endorsement on the above letter.

Is it proposed by the chief topographical engineer to allow the boat to pass from under his control, or only to be employed under the supervision of such person as the government shall choose to put in charge of it, all expenses being provided for and a satisfactory security given against loss to the government?

JEFF'N DAVIS,
Secretary of War.

WAR DEPARTMENT, *September 25, 1854.*

N 6.

Colonel Abert to the Secretary of War.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, September 26, 1854.

SIR: I have the honor to acknowledge a reference to this office of the report of the 22d instant. On reading over the report from this office, I readily admit the necessity of the questions now put, and in order to remove all doubts, and as a substitute for any other plan, it is respectfully proposed that the "committee" referred to in the letter of General Cass be required only to raise requisite funds; to hold these funds subject to the control of such officer or agent as the War Department shall appoint; this officer or agent to expend said funds,

and to use said boat, for the improvement of the St. Clair flats, in conformity with such plan as the War Department shall approve.

The St. Clair flats work is under the general direction of Brevet Lieutenant Colonel Graham; But, considering his duties on Lake Michigan, it will, I think, be found advisable to have an officer or local agent in the immediate direction of the work on the flats.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,

Secretary of War.

N 7.

Endorsement on the foregoing.

Approved as recommended. The committee will be distinctly informed that no claim to refund the money expended, or for other indemnity on account thereof, is to be based on the acceptance of their proposition to use the United States dredge-boat, at their expense, for the purpose of deepening the channel over the St. Clair flats.

JEFF'N DAVIS,

Secretary of War.

WAR DEPARTMENT, *October 4, 1854.*

N 8.

Colonel Abert to the Secretary of War, on submitting the final views of the board of engineers in regard to the St. Clair flats improvement.

BUREAU OF TOPOGRAPHICAL ENGINEERS,

Washington, September 30, 1854.

Sir: I have the honor to submit the final views of the board of engineers (see N 9) in reference to the St. Clair flats. From these views it appears that to make a channel 300 feet wide (exclusive of cost of dredge-boat) will require (A) \$27,252; and that to make a channel 600 feet wide (exclusive of cost of dredge-boat) will require (B) \$59,563. In the estimates the board excludes the plan of protecting either or both sides of the artificial channel-way by crib work and sheet piling. It would be a fortunate event if some structure of this kind were not required. In my opinion it is essential and will be required; and, to avoid the evil of removing it in order to enlarge the channel at a future day, the work should, in the first instance, be applied only to one, the permanently fixed side. This consideration

would probably add to the estimate for the 300 feet channel about \$5,000, enlarging that estimate (A) to about \$32,000. It is also probable (in my opinion) that this protecting work will be required before the dredging be commenced.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps of Topographical Engineers.

Hon. JEFFERSON DAVIS,

Secretary of War.

N 9.

Report of the board of engineers to the chief topographical engineer on the plan for improving the channel over St. Clair flats.

OFFICE BOARD OF ENGINEERS

FOR LAKE HARBORS AND WESTERN RIVERS,

Washington, September 25, 1854.

Sir: In relation to the question of improving St. Clair flats, Michigan, a subject recently referred to the board for consideration and a final report, I am instructed to make the following statement, viz:

St. Clair river, at its outlet in St. Clair lake, forms a very extensive delta, occupying an area roughly estimated at 70 or 80 square miles. Within this area the river breaks into numerous branches and enters the lake very much reduced below its original velocity. Owing probably to this diminution of velocity, extensive shoals are found in front of the delta, and in these shoals are channels more or less useful for navigation, but obstructed by bars. The channel presumed to be most convenient for navigation is the south channel or pass, and its subordinate channels named on the charts.

The western channel, the middle channel, and the eastern channel of the south pass.

One of the questions in the present investigations is, which of these channels should be selected for improvement? The board, while engaged upon the estimates for lake harbors for the fiscal year ending June 30, 1855, had before it an item for the improvement of the navigation of Lake St. Clair. It had before it also the report, plans, and estimates of Captain Canfield, late of the corps of topographical engineers, and for the reasons "adduced by Captain Canfield, it was of opinion that the middle channel (of the south pass) should be adopted for improvement; and, moreover, that the lesser width (300 feet, recommended by him be first opened, and hereafter, should the operation prove successful, and the wants of trade call for a greater width, that it then be increased to at least 600 feet."

Captain Canfield was of opinion that sheet piling should be employed for the protection of the sides of the proposed channel, and the

board in its report admitted this amongst the items which it adopted. He makes, however, the following remarks bearing upon the subject of the composition of the shoals, and the probable permanency of the channels:

“If it is borne in mind that the place is entirely out in the open lake more than a mile and a half from anything like shore, the fact will be apparent that there can be scarcely any perceptible current at that place, not sufficient in any decree to affect the bottom.” He says, also, “it is found by the survey of last fall that scarcely any change has taken place in the depth and form of the channel within the last ten years, when the first survey was made.” These observations go to justify the opinion that the sides of an artificial channel would not probably require protection, if they were cut to the same slope as that which we already find standing in the natural channel. For these reasons the board is not prepared to advise the use of sheet piling, or of any other protection for the sides of the proposed channel in the first instance, more especially if it is to be opened at first upon a width of only 300 feet, with the prospect of enlarging it hereafter to a width of 600 feet or more, for it would savor of extravagance to establish lines of piles which must be necessarily removed as a preliminary to such enlargement, and it might be also objected, that in a few years the piles would decay to the surface of the water, and, being in the open lake, would, in rough weather, be dangerous to vessels passing between them in the night. For these reasons, the board repeats the opinion, that the plank piling provided for in the estimate should not be used until experience shall have shown that they are necessary for the defence of the channel.

It should be observed, that the lines traced in red upon the chart, indicating the proposed lines of improvement, are intended by the board to show only the general position and direction of the work. It is desirable that the first excavation should be made upon the lines the most convenient for the ultimate *enlargement* of the channel, which should proceed at the same time from both sides of the original cut, nearly on straight lines, these being the most convenient for vessels proceeding up and down the channel, especially at night. The depth of the channel should be twelve feet.

Should the plank piling be omitted, there will be occasion for a greater number of channel marks than has been provided for in Captain Canfield's estimates. This, however, is presumed to be a subject within the province of the Light-house Board.

The contemplated light-house should occupy the position selected by Captain Canfield, namely, at R. Its distance from the nearest light, at the head of Detroit river, is but about eighteen statute miles. The light, therefore, need not be of a superior order, nor very elevated. A Fresnell illuminating apparatus of the fourth order would be sufficient. It should illuminate the whole of the horizon. The beacon-light should be the usual lantern employed by the Light-house Board for wharf lights.

With the preceding modifications, the estimates for a channel three hundred feet wide at bottom and twelve feet deep, with sloped sides of twenty feet one inch, would stand as follows, viz:

Dredging, 112,455 cubic yards for channel ;
do. 44,982 cubic yards for sides ;

Total, 157,437 cubic yards of dredging, at 12 $\frac{1}{4}$ cents	\$19,680
Mud scows, tools, coal wharf, &c.....	4,000
Contingencies, excluding risks to vessels, &c., by fire or weather, 15 per cent.....	3,552
Total cost of improvement, exclusive of dredger, which has been already provided.....	27,232

Estimated cost of excavating a channel at the same locality, six hundred feet wide at bottom and twelve feet deep, with sloped sides twenty feet one inch :

Dredging, 112,455 cubic yards of channel ;
do. 44,982 cubic yards of sides ;

Total, 157,437 cubic yards excavation, at 12 $\frac{1}{2}$ cents	\$19,680
112,455 cubic yards of channel, at 25 cents.....	28,114
Mud scows, tools, coal wharf, &c.....	4,000
Contingencies, as per preceding estimate, at 15 per cent ...	7,769
Total cost of improvement, exclusive of steam dredger.....	59,563

As already noticed, the board has had before it, during the investigation of this subject, the report of Captain Canfield, contained in the printed copy, third part of the message and documents of the President of the United States, at the commencement of the first session of the Thirty-third Congress, page 145, together with a manuscript copy of Captain Canfield's plans. Also, opinions reported by this board upon the same subject, and contained in the document already referred to, page 208. It had also the map of survey of the St. Clair flats, executed by Lieutenant Macomb, in 1842, under the direction of Captain Williams, late of the corps of topographical engineers, together with Captain Williams' report upon the proposed improvement ; and, finally, it had the surveys executed in 1852, by Captain Macomb, of the corps of topographical engineers, and the views of the bureau, set forth in its report of May 28, 1852, printed in Executive Documents No. 76, Thirty-second Congress, first session, Senate.

A copy of the chart and plans accompanying Captain Canfield's report is transmitted herewith, and the other manuscript matter is returned to the bureau.

Very respectfully, I have the honor to be, sir, your obedient servant,

JAMES KEARNEY,

*Lieutenant Colonel Topographical Engineers,
President of the Board.*

Colonel J. J. ABERT,

*Chief Topographical Engineers, United States Army,
Bureau Topographical Engineers, Washington.*

N 10.

Endorsement on the foregoing.

The recommendation of the board for the improvement of the middle channel of the South Pass by dredging, so as to give a channel three hundred feet wide at the bottom and twelve feet deep, the sides having an equal slope to those of the natural channel, is approved as the plan to be first executed when the necessary means shall be provided.

JEFF'N DAVIS,
Secretary of War.

WAR DEPARTMENT, *October 4, 1854.*

N 11.

The Secretary of War to the Hon. S. G. Haven, M. C. from Buffalo, New York.

WAR DEPARTMENT,
Washington, October 7, 1854.

SIR: I have received your letter of the 20th ultimo, stating the great interest felt by the citizens of Buffalo in the improvement of the navigation of the St. Clair flats, and asking favorable consideration of the application of citizens of Detroit for the use of a government dredge-boat, to be employed with means raised by private subscription for that purpose.

The enclosed copy of a letter this day addressed to General Cass,* who made the application above referred to in behalf of the citizens of Detroit and others, will inform you that the department is willing to grant the use of the boat in such mode as will answer the views of the applicants while securing its employment for a public and authorized purpose. In answer to your inquiry as to what has been done with the money appropriated for the improvement of the navigation of St. Clair flats, I have to state that it was exhausted in building the dredge-boat above mentioned.

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

Hon. S. G. HAVEN, *Buffalo, New York.*

* See N 12.

N 12.

The Hon. the Secretary of War to the Hon. Lewis Cass, United States Senator from Michigan.

WAR DEPARTMENT,
Washington, October 7, 1854.

SIR: I have received your letter of the 16th ultimo, communicating the request of a committee in behalf of persons interested in the navigation of the lakes, that this department would give them authority to use the dredge-boat built for the purpose of deepening the channel over the St. Clair flats, in the prosecution of that work at their own expense. In reply thereto, I have the honor to inform you that the department cannot allow the boat to pass from under its control, but that it may be employed under the supervision of an officer or agent of the government, to be designated for that purpose, the committee being required only to raise the requisite funds and place them subject to the control of the officer or agent authorized to expend them, and use said boat for the improvement of St. Clair flats in conformity with the plan the department has adopted. It will be proper also to inform the committee that no claim to refund the money expended, or for the indemnity on occasions thereof, is to be raised on the acceptance of their proposition to use the dredge-boat at their expense.

These views have been communicated to the topographical bureau, and will be carried out by it, if acceptable to the parties interested.

In connexion with this subject, I herewith transmit for your information a letter from the Hon. S. G. Haven, stating that the merchants of Buffalo are interested in the improvement referred to, and will contribute funds to aid in accomplishing it.

Very respectfully, your obedient servant,

JEFF'N DAVIS,
Secretary of War.

Hon. LEWIS CASS, *Detroit, Michigan.*

P. S.—The project and estimate for the work will be communicated to you, for the information of the committee, by the topographical bureau.—(See N 9 and N 10 preceding.)

N 13.

Colonel Abert to the Hon. Lewis Cass, United States senator from Michigan.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, October 10, 1854.

SIR: I have the honor to inform you that a copy of the report, plan, and estimate, in reference to the St. Clair flats, as approved by

the War Department, has been made, and is now on deposit with Captain J. A. Macomb, at Detroit. His orders are to permit the same to be examined by any one, and copies thereof to be taken.

The papers sent to Captain Macomb are the plans, &c., &c., which will be the guide and rule of the officer or agent designated by the War Department to superintend the work and to expend the funds which shall be raised to execute the work.

The conditions of using the St. Clair flats dredge-boat being fully stated in the letter to you from the War Department of the 7th instant, need no further allusion to them in this letter.

Please make known to this office the names of the committee, or of the chairman of the committee, which is to raise required funds.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Hon. LEWIS CASS,

United States Senator, Detroit, Michigan.

N 14.

Colonel Abert to Lieutenant Colonel Graham.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 25, 1855.

SIR: I transmit a copy of a letter from the Board of Trade at Buffalo, and a copy of the reply.*

You will repair to Detroit as soon as practicable, in order to make the arrangements referred to in the reply to Mr. Fox.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

Major J. D. GRAHAM,

Corps Topographical Engineers,

Bvt. Lieut. Colonel United States army, Chicago, Illinois.

N 15.

W. A. Fox, Esq., of Buffalo, New York, to Colonel Abert.

BUFFALO, May 21, 1855.

SIR: I see by a letter addressed by the Secretary of War to Hon. Lewis Cass, October 7, 1854, that the matter of the dredge-boat built for the purpose of dredging a channel across St. Clair flats has been referred to your bureau.

The permission accorded by the Secretary to use the dredge is, it

* See N 15 and N 16.

seems, accompanied by the condition that the money raised by private subscription shall be expended by an officer or agent of the government placed in charge of the dredge, and in conformity with the plans adopted by the bureau.

The Board of Trade of the several lake cities have appointed a committee to carry out their wishes, and some twenty thousand dollars has been subscribed for the purpose of making the improvement.

Inasmuch as no claim for indemnity is asked or allowed for moneys expended, we would inquire whether the dredge may be used by some person whom we may designate being appointed to carry on the work, under the supervision of an officer of your corps, so far as to insure the adoption of the plans which you have determined upon and the security of the government against the improper use or abuse of the dredge. We trust that this plan will meet your favorable consideration, as it will enable us, with the means at our disposal, to make an improvement which is much needed by our lake commerce.

Respectfully, your obedient servants,

WATSON A. FOX,
B. S. SHEPARD,
E. W. HUDSON,
GEO. W. HOLT,
H. C. WALKER,

Committee.

By WATSON A. FOX,
Chairman committee.

P. S. We are informed that the dredges at Erie and Chicago are not at present in use; and if either one or both of them could be obtained in addition to the one at Detroit, it would facilitate the work very much.

Please inform us whether our views meet those of the department, and oblige,

Very respectfully, yours, &c.,

WATSON A. FOX,
Chairman committee.

Colonel J. J. ABERT,
Topographical Bureau, Washington.

N 16.

Colonel Abert to W. A. Fox, Esq.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, May 25, 1855.

SIR: Your letter of the 21st instant has been received, and has been read to the Secretary of War.

It is understood to desire, on behalf of the committee, that a person to be selected by the committee should be the local agent and engineer

for the St. Clair flats work, who should perform his duties under the direction of an officer of the corps of topographical engineers, designated to superintend the work, "so far as to insure the adoption of the plans which you have determined upon, (more correctly the plans of the Board of Engineers, as approved by the War Department, which have been sent to Detroit to the care of Captain Macomb,) and the security of the government against the improper use or abuse of the dredge;" namely, the dredge-boat built for the St. Clair flats. No objection is entertained to this proposition.

Moreover, I am desired to say that it would be agreeable to place the funds of the committee in the hands of this local agent to be expended by him, to be accounted for by him to the committee.

The officer superintending the work could be required to certify to appropriateness of the expenditure, but not to have any of said funds placed in his hands, except in the form of payments to him for transportation charges on visiting and inspecting the work, and connected with said St. Clair flats work.

Your second proposition, also, to use on the flats the dredge-boats on Lakes Erie and Michigan, is held under advisement. Serious doubts being entertained if these boats can be so used without authority of law, and on other than work in conformity with United States appropriations.

A copy of this letter will be sent to Lieutenant Colonel Graham, now at Chicago, who will be required to repair to Detroit, in order to meet the committee agent, and arrange about the work.

Respectfully, sir, your obedient servant,

J. J. ABERT,

Colonel Corps Topographical Engineers.

W. A. Fox, Esq.,

Chairman Committee Board of Trade,

Buffalo, New York.

N 17.

Lieutenant Colonel Graham to Colonel Abert, reporting proceedings in regard to the improvement of St. Clair flats channel.

[No. 80.]

OFFICE GENERAL SUPERINTENDENCE OF

LAKE ST. CLAIR HARBOR WORKS,

Detroit, May 31, 1855.

SIR: I have the honor to report to you that, in obedience to your instructions of the 18th instant, I left Chicago on the 27th, and on the 28th I had an interview, at this place, with the committee, composed of delegates from Buffalo and Detroit, on the subject of deepening the channel over the St. Clair flats. I acquainted the committee fully with the conditions contained in your communication to me of the 18th instant, and the documents accompanying it, upon which they could have the use of the United States steam dredge, now at this

place, in aid of the object in view. The channel adopted by the committee to be deepened, after a full examination by the engineer in their employment, is precisely that which was recommended in the report of the late Captain Canfield, of the corps of Topographical Engineers, and which was confirmed by the Board of Engineers, and adopted by the War Department, viz: the middle channel of the South Pass, between Lake St. Clair and the river of the same name.

The committee seemed to think that the instructions from the bureau required that the funds raised by private subscription for this improvement should be disbursed by the United States superintending engineer; but I informed the gentlemen of the committee that I did not so construe the instructions, especially as such a construction would be at variance with the regulations of the War Department, of June 4, 1853.* These preliminaries being settled, we next proceeded to examine the condition of the dredge-boat and its engine. We found the engine very much rusted. A machinist of this place was called on to examine it, and to furnish an estimate of the cost of putting it in good working condition. His estimate, a copy of which is hereto attached, marked (N 18,) amounts to the sum of \$936.

After mature reflection, the committee came to the conclusion that the amount of funds placed at their disposal would not justify their accepting the use of the dredge on the condition stated, viz: that they were to be at the expense of putting it in working order; but they wished to hold this point under consideration, in case their funds should be increased.

Since they left this place to return home, I observe, by the newspapers, that the Canadian government has subscribed twenty thousand dollars as a contribution to this improvement, to be placed under the control of this committee, thus raising the fund to about \$40,000. Whether, under these circumstances, they will wish the use of the dredge, I cannot now say. Since the dredge was raised from her sunken condition, Captain J. N. Macomb, topographical engineers, by my request, has had her lying by his surveying steamer, and watched by his own crew; but the captain is now about to proceed on his survey, and I have been obliged this day to employ a trusty man as watchman, to reside on board the dredge-boat, at a compensation of one dollar per day, to prevent depredations and to guard her against fire, until I shall receive specific instructions from the bureau, as to what further course I am to pursue in regard to this matter.

I have just returned from an inspection at the mouth of Clinton river, and will return to Chicago the day after to-morrow.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Major Top. Eng., Brevet Lieutenant Colonel,

Superintending Engineer, &c., &c.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

* See a preceding document, marked E 44, under the head of Milwaukie harbor.

N 18.

Proposal from Charles Kellogg, of Detroit, for repairing and clearing the machinery of the United States steam dredge belonging to the St. Clair flats improvement.

DETROIT, May 29, 1855.

I will refit the engine and machinery of the United States steam dredge-boat, and put the same in good condition, including boiler, engine, and all working machinery, to be taken down and thoroughly repaired and put in good condition for business; together with two boilers, iron tanks to receive water from out to supply engine. Tanks to be connected with pipes and cocks so as to be impossible to sink the boat.

Each tank to be two feet wide, four feet long, and three feet deep. Boiler to be thoroughly cleaned and painted inside and out, and all machinery about the engine that shall require to be made new, shall be made new, and delivered in working condition, (you furnishing fuel to make steam,) for the sum of nine hundred and thirty-six dollars (\$936.)

CHARLES KELLOGG.

N 19.

Colonel Graham to Colonel Abert.

[No. 83.]

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, June 2, 1855.

SIR: I returned to this place this evening from Detroit. I reported to you on the 31st ultimo,* the proceedings had at that place with the committee appointed by the delegates from the several lake cities, on the subject of deepening the channel over St. Clair flats. I have now the honor to acknowledge the receipt of your letter of the 25th ultimo, and its accompanying documents, in relation to the same subject.

I have here to state, that the steam dredge-boat built for Lake Michigan could not possibly be spared to go to St. Clair flats, without abandoning the interests of the harbors on said lake, for whose benefit she was constructed. There are so many of these harbors on Lake Michigan demanding her services, that she will be kept in active operation in their improvement during the whole of the present season.

My own opinion is, that it would be an economical step on the part of the committee, with the means now at their disposal, to repair the dredge-boat now at Detroit, and use her on the flats, and I think they may yet come to that conclusion.†

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Major Top. Eng., Brevet Lieutenant Colonel,

Superintending Engineer, &c., &c.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

* See N 17.

† See N 20.

N 20.

Colonel Graham to Mr. Williams.

OFFICE GENERAL SUPERINTENDENCE

OF LAKE MICHIGAN AND ST. CLAIR WORKS,

Chicago, June 26, 1855.

SIR: On my return here, this afternoon, from an inspection of some of the works on the west side of this lake, I find a telegraphic message from W. A. Fox, esq.,* informing me that the committee on the St. Clair flats improvement have concluded to take the United States dredge-boat now at Detroit for use on that improvement. Under the rules laid down by the War Department, Mr. Fox informs me also that you were to be at Detroit to-day, and wished to meet me there. I am compelled, just now, to attend here to the closing of several matters for the end of this quarter.

I, however, enclose an order to Mr. Peter Pexton, who is a watchman on board the vessel, to allow you to go on and have the engine repaired, and to do whatever you may think necessary to get her in proper order. Please write to me and let me know if this will suit your purposes for the present, and how soon you would wish to go to the flats to have the work laid out, and I will endeavor to expedite all, as far as I am concerned, to the satisfaction of the committee.

I am, very respectfully, your obedient servant.

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer, &c., &c.

FRANK WILLIAMS, Esq.,

*Civil Engineer, &c., &c., Detroit, Michigan.**Colonel Graham to Mr. Pexton.*

N 21.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, June 26, 1855.

SIR: The committee for the St. Clair flats improvement is to have the use of the United States steam dredge now at Detroit for the said improvement.

You will please, therefore, place her at the disposal of F. Williams,

**Mr. Fox to Colonel Graham.*

[By Telegraph.]

"BUFFALO, June 25, 1855.

"We have concluded to take the United States dredge at Detroit. Engineer F. Williams will be at Detroit on Tuesday morning, the 26th instant, at Dibble's Hotel. Can you meet him?"

*"W. A. FOX, Chairman of Committee, &c.**"To Colonel GRAHAM,**Superintending Engineer, &c., &c., Chicago."*

esq., civil engineer, for repairs, &c., as he may direct. You will continue to live on board and perform the duty of watchman until I arrive at Detroit, and as long as the vessel remains there. Have the inventory prepared of all the rigging, &c., on board.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieutenant Colonel, &c., &c.

Captain PETER PEXTON,
Watchman United States steam dredge, Detroit, Michigan.

N 22.

Colonel Graham to Mr. Kellogg.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, June 28, 1855.

Sir: The committee for the improvement of the St. Clair flats have again applied for the United States steam-dredge now at Detroit, and they will be allowed to use her, they paying all expenses of putting her in good working order.

As the estimate you made for putting the machinery in order on the 29th ultimo is general in several respects, it will be requisite for you to make a bid in full detail, stating all the various items of cost and item of work. I request that you will re-examine the machinery, and have your bid ready in a day or two, as I expect then to be in Detroit to co-operate with the committee on the subject. Can you not reduce the amount of your former estimate?

Very respectfully, your obedient servant,

J. D. GRAHAM,
Lieutenant Colonel, Superintending Engineer, &c.

Mr. CHARLES KELLOGG,
Detroit, Michigan.

N 23.

Colonel Graham to Mr. Williams.

OFFICE GENERAL SUPERINTENDENCE &c.,
Chicago, June 28, 1855.

Sir: Thinking that probably Mr. Kellogg may be able to put the engine, &c., of the United States steam dredge in good order for a less sum than that stated in his bid of May 29th last, namely, \$936, I have written to him to make out an estimate and bid more in detail, and have it ready for inspection by the time I shall arrive at Detroit, say the 30th instant. The department rule, I find, requires me to see that the machinery goes into competent hands for repair, which must be inspected and approved by me, though all dis-

bursements are to be made by the committee. You will please, therefore, come to no agreement on the subject until I join you in Detroit.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieutenant Colonel, Superintending Engineer, &c.

FRANK WILLIAMS, Esq.,

Civil Engineer, &c., Detroit.

N 24.

Mr. Williams to Colonel Graham.

DETROIT, July 2, 1855.

SIR: I received yours of the 28th ultimo this afternoon, having just returned here after a short absence. Immediately upon receiving yours of the 26th ultimo, I contracted with Mr. Kendrick, agent for the Detroit locomotive works, (formerly De Graff, Kendrick & Co.,) to put the engine, &c., of the United States steam dredge in good order, making a written agreement with him, and specifying, as particularly as I could, the nature of the work to be done. I had previously asked Mr. Kellogg to make a detailed estimate, and endeavored to get from him some proviso to do the work for a less amount in case certain portions of the machinery should, when taken apart, prove to be in good order, but did not succeed in obtaining from him either the one or the other. For these reasons, as well as because I thought his estimate high, I called upon Mr. Kendrick for an estimate.

Mr Kendrick has pushed the work forward rapidly, and the engine certainly is not in as bad order as I had supposed. I shall regret it very much if the course pursued should not meet your approbation, as it has been my intention to have the dredge repaired only subject to your approval and inspection. I am in hopes that your arrival here will relieve me from the dilemma that I am now placed in.

I remain, sir, very respectfully, your obedient servant,

FRANK WILLIAMS.

Lieut. Col. J. D. GRAHAM, *United States Topographical Engineers, and general superintending engineer of public works on Lakes Michigan and St. Clair.*

N 25.

Colonel Graham to Mr. Williams.—Instructions for dredging on St. Clair flats.

OFFICE GENERAL SUPERINTENDENCE,

Chicago, July 26, 1855.

SIR: The United States steam dredge-boat for St. Clair flats improvement having been put in good working condition at the ex-

pense of the fund raised by the committee for Buffalo and the other lake cities, she will be employed in deepening the middle channel of the South Pass, necessary for a free navigation from Lake St. Clair, through St. Clair river, into Lake Huron, in conformity with the rules laid down by the War Department, which have already been made known to the chairman of the committee, at Buffalo, New York.

After having staked out the above named channel over the "Flats," you will please report it for my inspection and approval. In the mean time, however, and without incurring any delay, you are authorized to proceed with the dredging, taking care that it be on the aforesaid channel, as marked upon the map of Captains Canfield and Macomb, of the corps of topographical engineers, a copy of which is in your possession.

This map will be found printed with the topographical documents which accompany the President's message to the Thirty-third Congress, at its first session. The rules laid down by the War Department require that the control of the United States dredge-boat, the employment of the steam engineer and others on board of her, and the whole operation of the dredging out the channel, shall be under the general supervision and direction of this office.

Under this provision, you are hereby authorized to employ, and report their names to this office for approval, a master or dredgeman to manage the working of the boat, a steam engineer to manage and direct the engine, and the necessary crew and laborers on board. Captain Peter Pexton, the watchman previously employed for the United States, will be continued in that capacity at a compensation of one dollar per day and found in board, at the expense of the committee, from and after the 15th July, 1855, to include which date he has been settled with by the United States. His duties will be to look to the safety of the vessel, and to guard her from accidents, especially from fire, and more particularly at night. For this purpose he must be up and on the alert frequently at night, under ordinary circumstances, and always during stormy weather, or when there is cause for more than ordinary apprehension of danger to the vessel. For these reasons he will be entitled to rest during the day.

In case of apprehended danger, he will give the alarm to the master, (the dredgeman, it is expected, will also fill that post,) who will call up the crew and do what may be right for the safety of the vessel. As watchman, he will be under your general direction when you are present, and under that of the master or dredgeman when you are not present.

On the 1st and 15th days of each month you will please make a brief report in writing to this office of the operations, stating the condition of the vessel and her machinery, and how she works, the number of cubic yards excavated and removed from the desired channel, the nature of the soil excavated, and any other circumstances of interest; also the names and capacities of the persons in employment.

I request that you will forward to this office a copy of the map, showing the results of your examinations, so far as now made, also a modified map to show the state of the channel, on the 15th of September ensuing, and another showing its condition when the dredging

shall cease for the season. These will be sent to the topographical bureau with my annual report.

I need scarcely add, that the excavated matter should be deposited at such a distance and in such a direction from the excavated channel that the prevailing current will tend to waft it *from*, rather than towards, that channel.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Lieut. Col. Superintending Engineer &c., &c.

FRANK WILLIAMS, Esq., *Civil Engineer, &c.*

N 26.

Mr. Williams to Colonel Graham.

DETROIT, August 2, 1855.

SIR : Returning from St. Clair flats this morning, I received yours of the 26th ult., and herewith submit, in conformity with your instructions, a statement, showing the result of operations thus far with the United States steam dredge. The number of cubic yards of earth removed up to the 1st of August was 1,136. Owing to the imperfections of the machinery connected with the raising apparatus, occasioning delays, and to the fact that one of our dumping scows proved to be too slightly built, we have not been able to work the dredge to her full capacity. This scow is now undergoing repairs, and will be ready in a few days. With two scows, the dredge is capable of removing 500 to 600 cubic yards per day.

The material proves to be of two kinds, viz: on the surface, and to a depth of two to three feet, we find a clear, coarse sand; below this, there is a deposit of sand and clay, very firm, so that it requires the whole working force of the engine to drive the bucket through it.

The persons now employed on the dredge are Martin Becker, engineer; John Moody, master and dredgeman; Peter Pexton, watchman; a fireman, and four other men, whose duties are partly upon the scows and partly upon the dredge.

I have staked out, in accordance with your instructions, the middle channel of the South Pass across St. Clair flats, and will send to you, with my report of the 15th instant, a map of the same, as you request. At the present time I am unable to prepare it, as I am obliged to go to Buffalo to-day on business connected with the dredging.

I find Captain Pexton a very useful and efficient man for the position assigned to him, and very attentive to the discharge of his duties as watchman, thus relieving me of considerable anxiety for the safety of the vessel.

Whenever you find it convenient to make a personal inspection of

the work, I will meet you at this place and proceed to the flats, if you will inform me by mail, a few days in advance, of your coming.

I am, sir, very respectfully, your obedient servant,

FRANK WILLIAMS.

Lieut. Col. J. D. GRAHAM,

*Superintending Engineer of Public Works of
Lakes Michigan and St. Clair, Chicago, Illinois.*

N 27.

Mr. Williams to Colonel Graham.

DETROIT, September 1, 1855.

SIR: I herewith submit to you the following report of the result of operations with the government dredge on St. Clair flats up to the present time. Being unavoidably absent from the flats on the 15th ultimo, I was obliged to omit my report of that date.

Amount of excavation removed.....	7,650 cubic yards.
Distance dredged.....	1,000 feet.
Width of dredging.....	55 feet.

Men employed: B. F. Davison, superintendent and dredgemaster; J. B. Walker, brakeman; M. Beckner, engineer; G. Coty, fireman; T. Williams, dipper tender; P. Pexton, watchman; Peter and Alfred Tonchay, A. Papien, and J. Shook, laborers on dredge and scows.

By reference to the accompanying sketches you will perceive the relative position of the work done and the location of the channel as sketched out. This channel follows the deepest water across the bar, (see map G No. 34,) and conforms to the one adopted by the War Department, (as shown by map G No. 33.)

It is now well marked with piles driven in clusters, as is also the channel above to the mouth of the river, and this is found already to be of great benefit to the shipping interest.

We have met with several accidents to the gearing, which have caused considerable detention. The clutch, for throwing the chain drum in and out of gear and working the heavy chain, has been broken and replaced with a new one. One of the hubs to which the chain drum is fastened, owing to its not having proper facilities for receiving oil, cut on to the shaft, and has also been replaced. Various other accidents have taken place, such as breaking small bolts and chains, owing partly, perhaps, to their having been out of use, and partly to an imperfect construction. The engine has worked well, and has not been out of order since leaving this place. The dredge is now in good order, and works well; she is capable of removing 500 yards per day, but we take out no more than 400, as we find it most advantageous not to work her to her full capacity.

I have made calculations as to the amount of steam carried, and have also procured a steam gauge and attached it to the boiler. I find

that the greatest amount of steam which we have ever carried is 45 pounds per square inch.

I am, sir, very respectfully, your obedient servant,

FRANK WILLIAMS,
Engineer, in charge, &c.

Lieutenant Colonel J. D. GRAHAM,
*United States Topographical Engineers,
Superintending Engineer of Public Works, &c.*

N 28.

Colonel Graham to Mr. Williams.

[Extract.]

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, October 4, 1855.

SIR: I duly received your report of September 1, with the map forwarded at the same time.

I hope the channel of 50 feet wide is nearly cut through the flat, as I am very desirous, if possible, when it is finished, to have some dredging done at Clinton river this autumn.

Please report to me the progress of the work up to the 10th of this month, accompanied by a small sketch, enough to show the length of the channel then cut 50 feet wide, and how deep. Also, the total number of cubic yards our dredge has (or will have) excavated during the season.

* * * * *

I am, very respectfully, your obedient servant,

J. D. GRAHAM,
Lieutenant Colonel, Superintending Engineer, &c., &c.

FRANK WILLIAMS, Esq.,
Civil Engineer, St. Clair Flats, Michigan.

N 29.

Mr. Williams to Colonel Graham.

ST. CLAIR FLATS, *October 6, 1855.*

SIR: Owing to various other duties which I have been called upon to perform, I was unable to make my report of 15th September, as required, to you.

I now respectfully submit for your consideration the following report

of work done by the government dredge on St. Clair flats up to 1st of October, 1855 :

Amount of excavation removed, 16,589 cubic yards.

The dredge-boat is in good order, leaks but little, unless when loaded down so as to bring the lower spud-bolts below water. We have no difficulty in keeping her clear of water even then by working the engine pump a portion of the time that we are dredging. The engine works well, and is found capable of doing the duty required of it with a pressure of forty to fifty pounds of steam per square inch, not at any time exceeding fifty pounds. The boiler has leaked considerably ever since we first took the boat, but not so as to impair its efficiency ; it should, however, be thoroughly repaired before working another season.

Since the date of my last report, one of the clutch arms attached to the chain-drum has been broken, owing to the unequal bearing of the clutches ; there are three only left, but the bearing being now quite uniform, I do not apprehend any danger of their breaking ; we have, however, a new casting ready to take the place of the old one, and shall replace it when we get through for the season, if not before. No other accident of any consequence has happened since my last report.

The steam capstan has been put in order, and is found to work admirably, thus saving a great deal of time and labor.

The same persons are now employed upon the dredge as were at the date of my last report, with the exception of the fireman.

For the past week the weather has prevented our working to advantage, and I do not anticipate doing much more here this season.

I am, sir, very respectfully, your obedient servant,

FRANK WILLIAMS.

Lieutenant Colonel J. D. GRAHAM,
*United States Topographical Engineers,
Superintending Engineer, &c., &c.,
Chicago, Illinois.*

N 30.

Colonel Graham to Mr. Williams.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, October 11, 1855.

SIR : I have just received your report of the 6th October. I request that you will report the length of channel dredged to a width of fifty feet and depth of twelve feet or more, and particularly what is the length that remains to be dredged to complete a channel twelve feet deep and fifty feet wide throughout.

This information is requisite to aid in my annual estimates of the St. Clair flats improvement.

Please give me due notice in advance of the time when the dredge

will be at Detroit, so that I may be there to inspect and receive her from you.

I should hope for a number of days yet favorable for dredging during the Indian summer.

I am, very respectfully, your obedient servant,

J. D. GRAHAM,

Lieut. Col., Superintending Engineer.

FRANK WILLIAMS, Esq.,

Civil Engineer, St. Clair flats improvement.

N 31.

Mr. Williams to Colonel Graham.

ST. CLAIR FLATS, October 24, 1855.

SIR: I received yours of the 4th and 11th instant last evening, having only at that time arrived at Detroit. I now forward to you the sketch and statement as directed, and the following report of operations to the present date, viz:

Distance dredged, 1,900 feet.

Distance required to be dredged to give a depth of twelve feet water through the flats, 1,700 feet.

Depth of dredging, 13 feet.

Average width of channel cut, 60 feet, and an additional width of 30 feet for a distance of 200 feet, as shown by the accompanying sketch.

Whole number of yards removed by government dredge, 19,589 cubic yards.

I have nothing new to report in regard to the condition of the vessels, machinery, or persons employed, since my last report.

No accident of any importance has occurred. The vessel is in good order, and leaks but little. The greatest pressure of steam used has been 50 pounds per square inch.

The material removed is at present coarse, hard sand, to a depth of ten feet (below the water surface;) below that depth a mixture of sand and marl very tenacious, so that the bucket frequently sets in it, and the pressure of steam used is barely sufficient. This has been the character of the material for the past two weeks.

The weather is very unfavorable for dredging, but in consideration of the importance of pushing the work as far as possible, I propose to keep the dredge here for perhaps two weeks longer, and will give you seasonable notice when I think it best to leave.

I am, sir, very respectfully, your obedient servant,

FRANK WILLIAMS.

Lieutenant Colonel J. D. GRAHAM,

United States Topographical Engineers,

Superintending Engineer of public works, &c., Chicago, Illinois.

N 32.

*Mr. Williams to Colonel Graham.*DETROIT, *October 29, 1855.*

SIR: The government dredge arrived here last evening. A terrible storm occurred on the flats about 12 o'clock on Saturday night, and the most severe we have yet experienced there.

The waves made a complete break over the deck of the dredge, and it was with great difficulty that she could be kept afloat. The windlass started from its place, and after the storm was over the dredge leaked so badly that it was unsafe to remain on the flats with her any longer.

I now await your orders in regard to the disposition to be made of her for the coming winter. Please inform me by telegraph when I may expect you here, and what disposition I shall make of her.

The past week has been very stormy, and nothing of any consequence has been done since the date of my last report.

I am, sir, very respectfully, your obedient servant,

FRANK WILLIAMS.

Lieutenant Colonel J. D. GRAHAM,
*United States Topographical Engineers, and
 Superintending Public Works, &c.*

N 33.

Colonel Abert to Lieutenant Colonel Graham.

[By Telegraph.]

WASHINGTON, *November 5, 1855.*

Your annual report is not yet received. It is much wanted.

J. J. ABERT,

Colonel Topographical Engineers.

Lieutenant Colonel J. D. GRAHAM, &c., &c.,
Chicago, Illinois.

N 34.

Colonel Graham to Colonel Abert.

[No. 110.]

OFFICE GENERAL SUPERINTENDENCE, &c.,

Detroit, November 9, 1855.

SIR: I have the honor to acknowledge the receipt of your telegraphic despatch of the 5th instant, informing me that my annual report is wanted. My report, No 102, of the 6th ultimo, stated to you the reasons why my annual report could not be rendered at the period stated in the regulations without the denial of my personal

attention throughout the month of September to efforts that became necessary in order to save a large amount of public property, at harbors where there were no regular agents, from total destruction or loss, from the violence of storms that had prevailed throughout that month, or from lawless and outrageous trespass.

My communications, No. 107, of the 26th ultimo, and 108, of the 31st ultimo, will, I trust, have sufficiently indicated to the bureau that my chief attention had to be continued to similar objects, as a matter of paramount duty, up to the last mentioned date. With that date the period commenced for paying off the working parties and making the necessary arrangements for closing the active operations at the several works for the season. With this duty I am now actively occupied, and there would be a great expense going on with but little profit to the government were this duty deferred until my annual report could be completed.

The dredging on St. Clair flats closed for the season at the end of October.

The United States steam dredge which was used under my direction for the purpose, at the expense of the fund raised by the committee of the lake cities, was reported to me at the close of this operation as in a leaking condition. There being no funds to employ an agent here to look to this very valuable machine, I was obliged to hasten here, at short notice, to take measures to secure her from being again sunk. This I have already done, but it admitted of no delay.

I am now bringing the work at the mouth of the Clinton river, from whence I returned here last night, to a close for the season, and am making the necessary arrangements for the security of the public property appertaining thereto during the approaching winter. As the funds for this work did not admit of the employing an agent there, all the responsibility of this duty devolve on me personally. So soon as these arrangements can be completed, I shall be obliged to go to St. Clair flats to make an examination of the channel there since the dredging, in order to report upon it, and as a necessary item in my estimate of the expense of perfecting that important work, to accompany my annual report.

I suppose it will appear evident to the bureau that the stated period for making the annual report having been necessarily occupied, in my case, in the performance of other duties of a paramount importance, rendered so by causes for the most part beyond all human control, it has been entirely impracticable to complete that report, and will continue to be so until the duties detailed above shall have been closed for the working season.

I have received the leave of absence for thirty days, forwarded to me through the bureau, but I shall not think of availing myself of this indulgence until after my annual reports shall have been forwarded to the bureau and the Light-house Board.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lieut. Col., &c., &c., &c.

Colonel J. J. ABERT,

Chief Top. Engineers, Washington.

N 35.

Estimate of the cost of dredging a channel to have a depth of twelve (12) feet of water through the middle approach, over St. Clair flats, to the South Pass of St. Clair river. The dredged channel to be 3,940 feet long, and three hundred (300) feet wide. (See maps G No. 33 and G 35, herewith submitted.)

The appliances which will be required for this operation, and which must be procured, in addition to the dredging machine and one scow now on hand, are, with their prices, as follows, viz :

4 mud scows, with drop bottoms, at \$375 each.....	\$1,500 00
1 small steam tug for towing off the mud scows and emptying them at a proper distance from the channel	10,500 00
1 surveying boat necessary for frequently sounding the channel-way, in directing the work, with necessary rigging	250 00
For necessary repairs of the United States steam dredger before being used.....	850 00
For the pay of one assistant, resident at the work, for two years, at \$1,400.....	2,800 00
For transportation, hire of office, purchase of fuel, and stationery, for two years, at \$800 per annum.....	1,600 00
Then will come the dredging operation, viz : For the excavation of 110,133 cubic yards from the channel-way, at 25 cents per cubic yard, which is the estimate of the expense of working the steam power dredging machine, and also the steam tug, including the pay of the crews on board, and of the laborers managing four mud scows, and their subsistence, and of fuel for the two steam vessels.....	27,533 25
	45,033 25
Add for unforeseen contingencies, occasional surveys of the channel, placing of beacons, &c., 2½ per cent.....	1,125 82
	46,159 07

NOTE.—If it be determined to open the channel-way 600 feet wide, then the above item of \$27,533 25 must be doubled, and the appliances above estimated for being sufficient for either case, the estimated amount required will be \$76,692 32.

J. D. GRAHAM,
Maj. Top. Eng., Bvt. Lieut. Col., Sup'ng Eng.
OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

N 36 A.

Estimate of the cost of close piling to protect the channel proposed to be cut by dredging over St. Clair flats, through the middle approach to the South Pass of St. Clair river. Length of piling required, 4,000 feet on the southeast side, and 3,880 feet on the northwest side; total, 7,880 linear feet of close piling.—(See the accompanying maps, G No. 33 and G No. 35. The lines are A E and B F, of map G No. 35.)

The machinery and appliances which will be required for the timely and most economical completion of this part of the work, in addition to those estimated for in the preceding estimate, marked N 35, are, with their appropriate prices, as follows, viz :

Four floating steam-power pile-drivers, of ten-horse power, with anchors, rigging, &c., complete, at \$2,000 each.....	\$8,000 00
Four timber scows, at \$300 each.....	1,200 00
For the purchase of one steam tug of 150 tons measurement, say ninety feet long on deck, and twenty feet beam, and seven feet hold, for towing timber or piles from the proposed depot on Herson island, which is the nearest firm land, and is six miles distant from the work.....	15,000 00
For the purchase of one schooner of 200 to 250 tons measurement, say 110 feet to 120 feet keel, 22 feet beam, and 8½ feet hold, to be anchored and used as a domicil for the resident assistant in charge, and for the laborers employed on the work, (the nearest place where they could board on land being six miles from the work,)*.....	8,000 00
For the purchase, by contract, of 7,880 oak piles, hewn one foot square, and 28 feet long, 220,640 cubic feet, at 15 cents.....	33,096 00

Expenses of driving the piles, as follows :

Each pile-driving machine will require—

1 captain, at.....	\$2 50	per day,
1 engineer, at.....	2 00	“
3 laborers, at \$1 25.....	3 75	“
2 tons of coal, at \$6 per ton.....	12 00	“

20 25

Then, the working of 4 steam-power pile-drivers, at \$20 25 each per day, for 150 days, between the beginning and ending of the season.....	12,150 00
---	-----------

* It will be seen by the details which follow this item, that there will be fifty persons to be accommodated with board and lodging on this schooner, exclusive of the crew of the steam tug, who are supposed to live on the tug.

Expenses of the steam tug, as follows:

1 captain, at.....	\$2 50	per day,
1 engineer, at.....	2 00	"
1 fireman, at.....	1 75	"
3 deck hands, at \$1 25.....	3 75	"
3 tons of coal, at \$6	18 00	"

Expenses of steam tug. 28 00 per day,
which for 150 days to the season, is..... \$4,200 00

Required on board the schooner at anchor:

1 master, at.....	\$2 00	per day,
2 watchmen, at \$1 25.....	2 50	"
1 steward, at.....	1 25	"
2 cooks for laborers, at \$1 25....	2 50	"

Expenses of schooner domicil,..... 8 25 per day,
which, for the 150 days in the season, is..... 1,237 50

For four yawl boats to attend the pile-drivers and to take
the hands to and from the schooner for meals and
sleeping, at \$100 each, including oars and rigging... 400 00

For a boat's crew of five men to attend the assistant in
charge when making his soundings and measurements
in laying off the work as it progresses, and for the
use of the superintending engineer when making his
inspections of the progress and character of the work,
at \$1 25 per day each, is \$6 25 per day, which, for
150 days, is..... 937 50

Contingencies, such as the repair of wear and tear of
machinery of the four pile-drivers, and the steam tug,
and keeping the schooner in order..... 3,000 00

For the services of four men to each pile-driver, in taking
the timber for piles from the rafts as they arrive, and
handling and preparing it, and putting it on the pile-
driver: for the four pile-drivers, 16 men, at \$1 25 per day
each, is \$20 per day, which, for 150 working days, is 3,000 00

For the services of one sub-assistant to attend the tide-
gauge, and to keep the record of all the meteorologi-
cal instruments, say for two years, at \$1 50 per day, is 1,095 00

For a set of meteorological instruments, the same as for
other stations mentioned. See estimate, marked A 17,
under the head of Chicago harbor..... 232 50

Sum of items..... 91,548 50
Add for contingencies, 2½ per cent.,..... 2,288 71

Amount required to defend both sides of the dredged
channel with close piling,..... 93,837 21

J. D. GRAHAM,

Maj. Top. Eng., Brev. Lieut. Col., Supt'g Engineer.

OFFICE GENERAL SUPERINTENDENCE,

Chicago, December 31, 1855.

N 36 B.

Estimate of the cost of close piling to protect the channel proposed to be cut by dredging over St Clair flats, through the middle approach to the South Pass of St. Clair river, preparatory to the completion of the proposed piers. Length of close piling proposed, 4,000 feet on the southeast border of the proposed cut, indicated by the line B F on the accompanying map, marked G No. 35. (See, also, the accompanying map, marked G No. 33.)

The machinery and appliances which will be required for the timely and economical execution of this line of close piling—in addition to those contained in the preceding estimate, marked N 35—are, with their appropriate prices, as follows, viz :

2 floating steam-power pile-drivers of 10 horse power, with anchors, rigging, &c., complete, at \$2,000 each.....	\$4,000 00
4 timber scows, at 300 each.....	1,200 00
For purchase of 1 steam tug of 150 tons measurement, say 90 feet long on deck, 20 feet beam, and 7 feet depth of hold, for towing timber, piles, &c.,* from the proposed depot on Herson island, which is the nearest from land, and is six miles distant from the work.....	15,000 00
For the purchase of 1 schooner of 250 tons measurement, say 120 feet keel, 22 feet beam, and 8½ feet hold, to be anchored and used as a domicil for the resident assistant in charge, and for the mechanics and laborers employed on the work, (the nearest place on land where they could board being 6 miles distant from the work)†.....	8,000 00
For procuring, by contract, 4,100 oak piles, (allowing 100 for waste by splitting in driving, defects, &c.,) hewn 1 foot square and counter-hewn on two sides, and 28 feet long, = 114,800 cubic feet, at 15 cents per cubic foot...	17,220 00
Expenses of driving the piles, as follows, viz :	
Each pile-driving machine will require—	
1 captain, at per day.....	\$2 50
1 engineer, at per day.....	2 00
3 laborers, at \$1 25 each per day.....	3 75
2 tons of coal per day, at \$6.....	12 00
Current expenses per day for each pile-driver.....	20 25
Then the expense of employés for working 2 steam-power pile-drivers, at \$20 25 each per day, say for 150 days, between the beginning and ending of the season.....	6,075 00

* This steam tug will also be used for towing down timber and stone for the pier-work provided for in the succeeding estimate, marked N 37.

† It will be seen by the details which follow this item in this estimate, and by those in the next estimate, marked N 37, that there will be seventy-two persons to be accommodated on this schooner.

Expenses of the steam tug, as follows, viz:

1 captain, at per day.....	\$2 50
1 engineer, at per day.....	2 00
1 fireman, at per day.....	1 75
3 deck hands, at \$1 25 each per day.....	3 75
3 tons of coal per day, at \$6 per ton.....	18 00

Current expenses of the steam tug per day..... 28 00

Then, \$28 per day for 150 days' engagement of crew..... \$4,200 00

There will be required on board the schooner, at anchor, the following crew:

1 master, at per day.....	\$2 00
2 watchmen, at \$1 25 each per day.....	2 50
1 steward, at per day.....	1 25
2 cooks, at \$1 25 each per day.....	2 50

Current expenses of the floating domicil, per day 8 25

Which, for 150 days' engagement, is..... 1,237 50

For 2 yawl boats to attend the pile-drivers, and to take the hands to and from the schooner in going to meals, and to work, &c., at \$100 each, including oars and rigging. 200 00

For the services of 4 men to each pile-driver, in taking the timber from the rafts and handling and preparing it for driving, = 8 men, at \$1 25 per day each, is \$10 per day; which, for 150 days' engagement, is..... 1,500 00

For a boat's crew of 5 men for the use of the superintending engineer when inspecting the work, and for the use of the resident assistant when taking soundings, and when laying off the work as it progresses, at 1 25 per day each, is \$6 25 per day, which, for 150 days' engagement, is..... 937 50

For the services of 1 sub-assistant to attend the tide-gauge and to keep the record of the observations on all the meteorological instruments, say for 2 years, at \$1 50 per day 1,095 00

For a set of meteorological instruments, the same as for other stations mentioned.—(See estimate marked A 17, under the head of Chicago harbor)..... 232 50

For repairs of wear and tear of machinery, such as the engines of the steam-tug, of the two steam-power pile-drivers, repair of boats and rigging, and for keeping the schooner in order..... 2,000 00

Sum of the above item..... 62,897 50

Add $2\frac{1}{2}$ per cent. for contingencies..... 1,572 43

Amount required to defend the southeast side of the dredged channel, by close piling..... 64,469 93

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lt. Col., Sup. Eng.

OFFICE GENERAL SUPERINTENDENCE, & C.,

Chicago, December 31, 1855.

N 37.

Estimate of the cost of two parallel piers, the one 3,880 feet long, and the other 4,000 feet long.—(See the lines A E and B F, in map G No. 35.) Total length of the pier-work 7,880 feet, by 20 feet wide and 17 feet high from the soil at bottom, in water 12 feet deep, required to protect and preserve the channel proposed to be cut over St. Clair flats, through the middle approach to the mouth of the South Pass of St. Clair river.—(See also map G No. 33.)

The work will require $246\frac{1}{4}$ cribs,* each 32 feet long, 20 feet wide, and 17 feet high from the bottom to the flooring at top, in order to attain a height of five (5) feet above the water surface. The cribs are supposed to be constructed according to the drawings given in detail on sheet G No. 19, presented with this report, except the bolting, which is to be of $1\frac{1}{2}$ inch round wrought-iron, disposed as shown in the sections on sheet G No. 21.

The cost of one such crib will be as follows. See the preceding table marked T 1, and the formula of computation thereto relating. See, also, the model in wood forwarded to the topographical bureau, with the drawings referred to in this report.

For 2,061 lineal feet of pine timber, hewn one foot square, at 13 cents per foot.....	\$267 93
For 880 lineal feet of white oak timber, hewn one foot square, at 15 cents per foot.....	132 00
For 1,482 feet, board measure, of three-inch white oak plank for flooring, at \$16 per thousand.....	23 71
For 4,824 lbs. $1\frac{1}{2}$ inch† round wrought-iron, for bolts, at 4 cents per lb.....	192 96
For 137 lbs. of wrought-iron spikes, three-eighths by three-eighths of an inch square, for fastening the flooring to the sleepers, at $7\frac{1}{2}$ cents.....	10 28
For 53 cords of hard boulder stone for crib ballast, at \$7 50 per cord, delivered at the depot, say at Herson island.....	397 50
For carpentry, labor, and superintendence.....	400 00
Sum of above items.....	1,424 38
Add 10 per cent. for contingencies.....	142 44
Estimated cost of one crib.....	1,566 82
Then, $246\frac{1}{2}$ cribs, at \$1,566 82 each, gives for the cost of the two parallel piers for St. Clair flats.....	\$385,829 43

* The $\frac{1}{4}$ of a crib, or 8 feet of length, would be provided by making 4 cribs, each 34 feet long.

† This size of iron is here adopted because the work, being exposed to the action of the waves of the broad expanse of the lake, eighteen miles in extent, on a segment from southeast to southwest, will require this strength of bolting.

The following appliances will be required:

Four strongly built crane scows, at \$750.....	\$3,000 00
Four strongly built stone scows, at \$500.....	2,000 00
Two portable smith's forges, at \$100.....	200 00
One blacksmith's shop, to be established on Herson island, with tools.....	400 00
One carpenter's shop, also there, with tools.....	400 00
Estimated cost of piers for St. Clair flats, Michigan.....	<u>391,829 43</u>

That is to say, three hundred and ninety-one thousand eight hundred and twenty-nine dollars and forty-three cents.

One of the portable forges will be required on the steam tug, and the other on the schooner, for necessary repairs of machinery, and for making bands for pile heads and shoeing piles when required.

The blacksmith's shop at Herson island will be necessary to do heavier work when required, and the iron bolts will there be cut to a proper length and prepared for driving. This alone will employ one blacksmith nearly all the time.

The carpenter's shop on Herson island will be necessary for doing most of the work of making the mortises and tenons in the crib timbers, in dressing those timbers on two sides to give fair and even bearings, adjusting their lengths, squaring their ends, &c. When thus prepared they will be formed into rafts and will be towed down to the work by the steam tug. It may be found advantageous to lay the latticed bottoms of the cribs and build them up five or six feet high at the depot on this island, and then tow them down and finish them, where they will be sunk in position. The current expenses of building the cribs, including those of the two shops and the two portable forges, are included in the item "for carpentry, labor, and superintendence," in the estimate of the cost of one crib.

The work of constructing the cribs would be conducted as follows, namely:

There would be eight working parties, each to consist of one foreman and seven carpenters and laborers, constantly employed in framing, boring the bolt-holes, driving the bolts, &c. Four of these parties, together with the blacksmith and one assistant, would be carrying on the appropriate part of the work at the depot on the island, making in all thirty-four persons.

The four other parties with a blacksmith, and one assistant to each portable forge, would live on board the schooner anchored at the flats, and would carry on the appropriate part of the work of building up the upper portion of the cribs, sinking them in position, putting in the stone ballast, laying the sleepers and the flooring. This will add thirty-six persons to the thirty-six enumerated in estimate No. 36 B to be accommodated on board the schooner—making a total of seventy-two persons.

By appropriating the hold of the vessel, (allowing a space in the fore-castle for a store-room for provisions,) and building a saloon on deck, this vessel would afford ample accommodations for that number of persons, and they would always be in position at the work. This

saloon would be built out of the contingent expenses already estimated for.

The length of the working season has already been estimated at 150 days, exclusive of Sundays. This would be the elapsed time between the beginning and ending of the working season, or the period for which all employés would have to be paid.

But, in calculating the progress of the work, and the time required for completing it, we must make a reasonable deduction for lost time from bad weather, when little or no work could be carried on at the exposed position at the flats. One day in seven, or say 20 days deducted from the 150, is little enough to be made in this climate, and especially for a position so much exposed to the winds from every quarter as St. Clair flats.

It will require the joint labor of a party of eight men at Herson island, and for a similar party stationed at the flats, during 10 to 12 days, let us say during eleven (11) days, to counter-hew, trim to standard measure, frame the latticed bottom, cut and fit the dovetailed mortises and tenons to a pattern, bore the bolt-holes, drive the bolts, sink in position, fill with stone, and complete the flooring for one crib.

Let it be borne in mind that there are 422 mortises and tenons (counting each as one) to be cut and accurately fitted to a model. If this part of the work be not done very carefully, the timbers would be easily rent asunder. Considering this and the rest of the work necessary to complete a crib, it will be seen that 11 days, or even 12 days, is little enough time to allow.

Allowing 11 days to each crib, the whole enumerated force in this estimate will complete and adjust in position 4 cribs in 11 days. At this rate it will require 677 working days, which, allowing, as above, 130 actual working days to a season, is equal to five and two-tenths ($5\frac{2}{10}$) years, with the means estimated for, to build the piers for St. Clair flats.

If we allow twelve (12) days as the time required for one crib, it will require five and two-third ($5\frac{2}{3}$) years to complete these piers.

Hence, the importance of the close piling on the windward side of the channel, in the first place, as per estimate No. 36 B, in order to afford a temporary protection to the cut-out channel-way, and thus avoid subjecting the immense commerce passing annually over these flats to the delay of five years and upwards in getting this obstruction removed.

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lieut. Col., Sup'g Eng.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 38.

Statement of the quantity and value of articles of merchandise received at the port of Chicago, State of Illinois, by lake, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels--	54,589	\$3 00	\$163,767 00
Apples (dried)----- bushels--	44,712	1 50	67,068 00
Beer..... barrels--	5,391	10 00	53,910 00
Boilers (steam)-----number--	95	1,500 00	142,500 00
Buggies and wagons -----do-----	162	100 00	16,200 00
Brooms -----dozen--	44,986	2 00	89,972 00
Bedsteads-----number--	9,983	5 00	49,915 00
Brandy -----casks--	244	400 00	97,600 00
Car axles-----tons--	1,465	90 00	131,850 00
Car wheels -----do-----	2,375	75 00	178,125 00
Castings-----do-----	433	100 00	43,300 00
Cattle-----number--	190	50 00	9,500 00
Champagne -----baskets--	975	12 00	11,700 00
Cheese-----casks--	2,953	30 00	88,590 00
Cider -----barrels--	11,801	7 50	89,440 00
Coal -----tons--	109,737	7 50	823,027 00
Codfish -----hogsheads--	447	75 00	35,550 00
Coffee -----sacks--	121,163	12 00	1,453,956 00
Fire brick-----number--	46,250	20	9,250 00
Glass-----boxes--	74,250	10 00	742,500 00
Grindstones -----tons--	1,247	40 00	49,880 00
Gas pipe -----do-----	1,730	45 00	77,850 00
Horses -----number--	640	150 00	96,000 00
Iron (railroad)-----tons--	28,737	75 00	2,155,200 00
Iron -----bundles--	3,633	3 50	12,715 50
Iron (pig)-----tons--	33,144	45 00	1,491,480 00
Iron -----bars--	22,524	1 20	27,028 80
Iron -----tons--	19,594	60 00	1,175,640 00
Lumber-----M feet--	5,460	15 00	71,900 00
Merchandise -----tons--	136,858	400 00	54,743,200 00
Mowing machines-----number--	335	104 50	35,000 00
Marble -----tons--	1,708	55 00	93,940 00
Merchandise-----packages--	2,564,129	7 50	19,230,967 50
Molasses -----gallons--	1,164,193	50	582,096 50
Nails -----kegs--	60,730	5 00	303,650 00
Oils -----barrels--	2,276	40 00	99,040 00
Pails -----dozen--	3,138	2 00	6,276 00
Porter -----barrels--	961	20 00	19,220 00
Rakes -----dozen--	5,251	3 00	15,753 00
Reapers -----number--	106	150 00	15,900 00
Railroad chairs-----do-----	7,000	20 00	1,400 00
Rosin -----barrels--	1,189	4 62	5,493 00
Salæratius-----boxes--	4,793	8 00	38,344 00
Salt-----bags--	1,081,481	12	129,777 00
Salt-----barrels--	211,656	2 50	429,140 00
Slate -----tons--	180	22 50	4,050 00
Starch -----boxes--	15,973	4 00	63,892 00
Steam engines-----number--	10	1,000 00	10,000 00
Stoneware -----gallons--	431,257	10	43,125 70
Stoves-----number--	547,412	8 00	4,379,296 00
Sugar -----pounds--	9,757,166	6	585,429 98
Tar -----barrels--	211	5 00	1,055 00

N 38--Continued.

Articles.	Quantity.	Price of each.	Value.
Threshing machines.....number..	140	\$100 00	\$14,000 00
Tobacco.....hogsheads..	1,493	76 53	114,300 00
Trees.....bundles..	5,334	20 00	106,680 00
Turpentine.....barrels..	394	30 00	11,820 00
Washboards.....dozen..	1,691	2 87 $\frac{1}{4}$	4,857 00
White lead.....tons..	5,619	221 00	1,241,799 00
Wine.....casks..	192	40 00	7,680 00
Total value of merchandise received at the port of Chicago, Illinois, which passed over St. Clair flats in 1855, and not included in any other enumeration herewith presented.....			91,771,717 98

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE,

LAKE MICHIGAN AND LAKE ST. CLAIR HARBOR WORKS,

Chicago, December 31, 1855.

N 39.

Statement of the quantity and value of articles of merchandise shipped from the port of Chicago, State of Illinois, by lake, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Ashes, pot.....tons..	112	\$7 50	\$840 00
Beef.....barrels..	58,286	13 00	757,718 00
Barley.....bushels..	2,145	1 25	2,681 25
Beans.....do.....	490	2 00	980 00
Broom corn.....bales..	6,130	19 62	120,270 00
Butter.....pounds..	499,870	16	79,979 20
Cattle.....number..	2,286	6 25	14,300 00
Corn.....bushels..	7,615,575	65 $\frac{1}{3}$	4,973,523 85
Corn meal.....barrels..	2,493	6 00	14,958 00
Eggs.....dozen..	137,896	10	13,789 60
Fish.....barrels..	387	9 00	3,483 00
Flaxseed.....bushels..	2,398	2 25	5,395 50
Flour.....barrels..	96,143	8 00	769,144 00
Grass seed.....bushels..	65,711	2 25	147,849 50
Ham and bacon.....pounds..	2,298,644	13	298,823 68
Hemp.....tons..	1,538	100 00	153,800 00
Hides.....number..	125,433	4 00	501,732 00
High wines.....gallons..	214,391	40	85,756 40
Hogs, live.....number..	1,016	15 00	15,240 00
Iron.....tons..	684	60 00	41,040 00

N 39—Continued.

Articles.	Quantity.	Price of each.	Value.
Lard ----- pounds--	2,500,550	\$0 10	\$250,055 00
Lead ----- pigs--	139,660	4 20	586,572 00
Oats ----- bushels--	2,371,493	35	830,012 00
Oil ----- barrels--	1,235	45 00	55,575 00
Oil cake ----- tons--	425	200 00	85,000 00
Pork ----- barrels--	55,675	17 00	946,475 00
Plaster ----- do--	300	3 25	975 00
Pelts ----- bales--	2,397	25 00	59,925 00
Reapers ----- number--	280	150 00	42,000 00
Rye ----- bushels--	16,525	1 25	20,656 25
Sheep ----- number--	296	1 50	444 00
Sugar ----- hogsheads--	380	69 00	26,220 00
Tallow ----- pounds--	887,600	12	106,512 00
Tripe ----- barrels--	312	40 00	12,480 00
Tobacco ----- hogsheads--	2,180	52 43	114,300 00
Wheat ----- bushels--	6,023,194	1 70	10,239,429 00
Wool ----- pounds--	1,834,553	30	550,586 68
Total value of merchandise shipped from the port of Chicago, Illinois, which passed over St. Clair flats in 1855, and not included in any other enumera- tion herewith presented-----			21,928,530 91

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 40.

*Statement of the quantity and value of articles of merchandise received
at the port of Milwaukee, State of Wisconsin, having come over St.
Clair flats during the year ending December 31, 1855.*

Articles.	Quantity.	Price of each.	Value.
Apples ----- barrels--	46,381	\$2 50	\$115,952 50
Apples, (dried) ----- pounds--	395,944	7	27,707 08
Axes ----- boxes--	3,475	10 00	34,750 00
Bark ----- cords--	1,020	6 00	6,120 00
Cheese ----- pounds--	383,500	10	38,350 00
Cider ----- barrels--	2,826	6 00	16,956 00
Coal ----- tons--	56,841	7 50	436,307 50
Codfish ----- boxes--	9,000	12 00	108,000 00
Coffee ----- bags--	30,154	15 00	452,315 00
Candy ----- boxes--	1,734	3 00	5,202 00
Glass ----- do--	25,300	2 50	63,250 00
Horses ----- number--	1,385	150 00	207,850 00
Iron ----- tons--	6,465	60 00	387,900 00
Iron, (railroad) ----- do--	13,992	60 00	839,520 00
Iron, (pig) ----- do--	1,821	45 00	81,945 00

N 40—Continued.

Articles.	Quantity.	Price of each.	Value.
Lumber.....M feet..	8,947	\$20 00	\$178,940 00
Leather.....rolls..	4,130	60 00	247,800 00
Molasses.....barrels..	10,436	20 00	208,720 00
Mackerel.....do.....	2,100	12 00	25,200 00
Merchandise.....tons..	50,180	140 00	7,025,200 00
Nails.....kegs.....	42,326	4 00	169,304 00
Oil.....barrels..	6,300	40 00	252,000 00
Plaster.....do.....	800	3 00	2,400 00
Rice.....tierces..	365	27 00	9,855 00
Raisins.....boxes..	36,500	3 00	109,500 00
Salt.....barrels..	74,592	1 75	130,536 00
Salt.....sacks.....	122,000	13	15,860 00
Salæratius.....boxes..	8,674	2 50	21,675 00
Soap.....do.....	12,000	8 00	96,000 00
Starch.....do.....	8,000	2 50	20,000 00
Steel.....tons.....	200	145 00	29,000 00
Sugar.....barrels..	15,944	18 00	286,992 00
Sugar.....hogsheads..	21,000	70 00	1,470,000 00
Stoves.....number..	22,200	10 00	222,000 00
Tea.....chests.....	22,700	22 00	499,400 00
Tobacco.....pounds..	1,400,000	12	168,000 00
White lead.....kegs..	22,000	2 50	55,000 00
Total value of imports at Milwaukie which came over St. Clair flats in the year 1855, not included in any other statement herewith presented.....			14,065,507 08

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 41.

*Statement of the quantity and value of articles of merchandise shipped
from the port of Milwaukie, State of Wisconsin, having passed over
St. Clair flats during the year ending December 31, 1855.*

Articles.	Quantity.	Price of each.	Value.
Ashes, pot.....tons..	187	\$100 00	\$18,700 00
Barley.....bushels..	51,196	1 00	51,196 00
Bacon.....pounds..	935,483	10	93,548 30
Beef.....barrels..	9,976	13 00	129,688 00
Corn.....bushels..	117,000	60	70,200 00
Cranberries.....do.....	500	4 00	2,000 00
Eggs.....barrels..	500	15 00	7,500 00
Fish.....do.....	2,140	9 00	19,260 00
Flour.....do.....	201,393	8 00	1,611,144 00
Grass seed.....bushels..	93,485	2 25	210,341 00
Hams and shoulders.....barrels..	13,704	18 00	246,672 00

N 41—Continued.

Articles.	Quantity.	Price of each.	Value.
Hops ----- pounds--	40,000	\$0 08	\$3,200 00
Hides ----- number--	15,000	4 00	60,000 00
Lard ----- barrels--	4,423	20 00	88,460 00
Lard ----- kegs--	501	10 00	5,010 00
Oats ----- bushels--	18,000	40	7,200 00
Pork ----- barrels--	36,546	15 00	548,190 00
Potatoes ----- bushels--	37,893	75	28,419 75
Rye ----- do--	61,646	1 00	61,646 00
Wheat ----- do--	3,186,493	1 65	5,257,713 45
Wool ----- pounds--	625,280	35	218,848 00
Total value of exports from Milwaukee which passed over St. Clair flats in the year 1855, and not included in any other statement herewith presented--			8,738,936 75

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 42.

*Statement of the quantity and value of articles of merchandise received
at the port of Detroit, State of Michigan, having come over St. Clair
flats during the year ending December 31, 1855.*

Articles.	Quantity.	Price of each.	Value.
Copper ----- tons--	739	\$522 00	\$413,840 00
Corn ----- bushels--	15,950	65	10,367 50
Fish ----- barrels--	3,495	9 00	31,455 00
Grindstones ----- tons--	325	47 00	15,625 00
Iron ----- do--	161	60 00	9,660 00
Laths ----- M--	11,267	3 00	33,801 00
Lumber ----- M feet--	7,391	16 00	118,256 00
Lumber, oak ----- do--	150	20 00	3,000 00
Oats ----- bushels--	47,000	40 00	18,800 00
Pork ----- do--	793	16 00	12,688 00
Shingles ----- M--	2,318	4 00	9,272 00
Total value of merchandise received at the port of Detroit, Michigan, which passed over St. Clair flats in arriving, in 1855, and not included in any other enumeration herewith presented--			676,764 50

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 43.

Statement of the quantity and value of articles of merchandise shipped from the port of Detroit, State of Michigan, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Cattle.....number.....	381	\$50 00	\$19,000 00
Lumber.....M feet.....	1,461	16 00	23,376 00
Lumber, oak.....do.....	130	20 00	2,600 00
Merchandise, such as teas, sugar, groceries, woolen and cotton goods, clothing, liquors, &c.....tons.....	67,900	300 00	20,370,000 00
Merchandise, such as teas, sugar, groceries, woolen and cotton goods, clothing, liquors, &c.....packages.....	21,000	25 00	525,000 00
Oil.....barrels.....	120	40 00	4,800 00
Pork.....do.....	3,800	16 00	60,800 00
Total value of merchandise shipped from the port of Detroit, Michigan, which passed over St. Clair flats in the year 1855, and not included in any other statement herewith presented.....			21,005,626 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 44.

Statement of the quantity and value of articles of merchandise received at the port of Toledo, State of Ohio, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Lumber.....M feet.....	7,139	\$16 00	\$114,224 00
Laths.....M.....	3,131	3 00	9,393 00
Shingles.....do.....	5,427	4 00	21,708 00
Total value of merchandise received at Toledo, Ohio, which came over St. Clair flats in 1855, and not included in any other statement herewith presented.....			145,325 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 45.

Statement of the quantity and value of articles of merchandise received at the port of Cleveland, Ohio, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Copper ----- tons	2,850	\$560 00	\$1,596,000 00
Fish ----- barrels	12,327	9 00	110,943 00
Flour ----- do	3,476	8 00	27,808 00
Iron ----- tons	2,631	60 00	157,860 00
Iron ore ----- do	6,332	40 00	253,280 00
Laths ----- M	3,629	3 00	10,887 00
Lumber ----- M feet	4,360	20 00	87,200 00
Potatoes ----- bushels	21,493	1 00	21,493 00
Shingles ----- M	4,332	4 00	17,328 00
Ship knees ----- number	240	5 00	1,200 00
Wheat ----- bushels	47,123	1 50	70,684 50
Total value of merchandise received at the port of Cleveland, Ohio, which came over St. Clair flats in 1855, and not included in any other statement herewith presented -----			2,354,683 50

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 46.

Statement of the quantity and value of articles of merchandise shipped from the port of Cleveland, State of Ohio, by lake, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beef. ----- barrels	3,473	\$13 00	\$45,149 00
Butter ----- pounds	115,080	15	17,262 00
Cattle ----- number	1,270	50 00	63,500 00
Cheese ----- pounds	52,421	10	5,242 10
Coal ----- tons	25,463	5 00	127,315 00
Corn ----- bushels	16,427	65	10,677 55
Flour ----- barrels	9,184	8 50	78,064 00
Hogs, (live) ----- number	321	12 00	3,852 00
Horses ----- do	43	100 00	4,300 00
Iron ----- tons	1,296	60 00	77,760 00
Lard ----- barrels	1,247	20 00	24,940 00
Merchandise ----- tons	21,394	400 00	8,557,600 00
Nails ----- kegs	5,634	5 00	28,170 00
Oats ----- bushels	15,940	40 00	6,376 00

N 46—Continued.

Articles.	Quantity.	Price of each.	Value.
Pork ----- barrels--	7,496	\$16 00	\$119,936 00
Railroad cars-----number--	40	1,000 00	40,000 00
Salt-----barrels--	14,862	2 00	29,724 00
Stoneware-----gallons--	27,380	10	2,738 00
Wheat -----bushels--	3,471	1 50	5,206 50
Total value of shipments, as far as they could be actually obtained, from Cleveland, Ohio, that went over St. Clair flats in 1855, not included in any other statement herewith presented--			9,247,812 15

Nearly all of the above articles were shipped to Lake Superior. The value of the respective articles of merchandise was obtained from the agent of one of the mining companies at Cleveland. It was impossible, without devoting a very long time and more labor than could be spared, to get this list complete in all its departments. There are many articles of shipment not included here, and it is believed that the whole value of shipments from Cleveland, over St. Clair flats, during the year 1855, amounted to full fifteen millions of dollars; that is to say----- \$15,000,000 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

N 47.

Statement of the quantity and value of articles of merchandise shipped from the port of Erie, State of Pennsylvania, by lake, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Coal-----tons--	32,391	\$5 00	\$161,955 00
Total value of merchandise shipped from the port of Erie, Pennsylvania, which went over St. Clair flats in 1855, and not included in any other statement herewith presented -----			161,955 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 48.

Statement of the quantity and value of articles of merchandise received at the port of Buffalo, State of New York, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Ashes, (pot)-----tons--	106	\$100 00	\$10,600 00
Barley.....bushels--	42,703	1 25	53,378 75
Beans-----do-----	640	2 00	1,280 00
Butter-----pounds--	43,540	15	6,531 00
Corn-----bushels--	122,973	70	86,081 10
Copper-----tons--	550	560 00	308,000 00
Cranberries-----bushels--	381	3 00	1,143 00
Fish-----barrels--	13,502	9 00	121,518 00
Flour-----do-----	32,436	8 50	275,706 00
Hams-----do-----	542	20 00	10,840 00
Hides-----number--	22,295	5 00	111,475 00
Laths-----M-----	1,960	3 00	5,880 00
Lard-----pounds--	132,000	10	13,200 00
Lumber-----M feet--	4,181	20 00	83,620 00
Oats-----bushels--	189,000	45	85,050 00
Oil-----gallons--	17,160	1 00	17,160 00
Plaster-----barrels--	1,496	3 00	4,448 00
Pork-----do-----	5,410	17 00	91,970 00
Potatoes-----bushels--	13,493	1 00	13,493 00
Rags-----tons--	527	45 00	23,715 00
Rye-----bushels--	73,310	1 25	91,637 50
Seed-----do-----	4,940	2 25	11,115 00
Sheep pelts-----number--	119,900	50	59,950 00
Shingles-----M-----	24,360	4 00	97,440 00
Shooks-----hhds--	7,502	4 00	30,008 00
Staves-----M-----	2,420	25 00	60,500 00
Timber-----M cub. feet--	54,600	8 00	436,800 00
Wheat-----bushels--	403,953	1 75	706,917 75
Wool-----bales--	1,370	35 00	47,950 00
Total value of merchandise received at the port of Buffalo, New York, which came over St. Clair flats in the year 1855, and not included in any other statement herewith presented-----			2,867,407 10

J. D. GRAHAM,

Major Top. Eng., Brevet Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C.,

Chicago, December 31, 1855.

N 49.

Statement of the quantity and value of articles of merchandise shipped from the port of Buffalo, State of New York, having passed over St. Clair flats during the year ending December 31, 1855.

Merchandise, embracing articles of chief value shipped by the American and by the western transportation companies, and by the principal shipping merchants of Buffalo, to Chicago, Milwaukee, and other Lake Michigan ports, also, to Mackinaw and Green Bay. This merchandise consists of broadcloths, cassimeres, silks, wearing apparel, and all other kinds of dry goods; Brussels and other carpetings; hats and caps; China, glass, and plated ware; drugs and medicines; straw goods, and all kinds of fancy articles.

It was impossible to get the items in detail here, as at other ports, without occupying several months in the labor. The books being footed in tons, it was considered the most accurate way to estimate the average value per ton. Five hundred dollars per ton is evidently below the average value of such articles. It is believed that \$750 average per ton would not be too much. But to be carefully within bounds, we assume \$500 per ton average. The statement stands, then, as follows:

Tons of merchandise shipped from Buffalo, New York, over St Clair flats, in the year 1855, and not included in any other statement herewith presented.

Quantity	153, 120
Price of each	\$500 00
Value	76, 560, 000 00

J. D. GRAHAM,

Major Top. Eng., Brevet Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 50.

Statement of the quantity and value of articles of merchandise received at the port of Oswego, State of New York, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Lumber M feet..	1, 200	\$16 00	\$19, 200 00
Total value of merchandise received at the port of Oswego, New York, which came over St. Clair flats in the year 1855, and not included in any other statement herewith presented.....			19, 200 00

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 51.

Statement of the quantity and value of articles of merchandise received at the port of Ogdensburg, State of New York, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
umber-----M feet--	497	\$20 00	\$9,940 00
Total value of merchandise received at the port of Ogdensburg, New York, which came over St. Clair flats, in the year 1855, and not included in any other statement herewith presented--			9,940 00

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 52.

Statement of the quantity and value of articles of merchandise shipped from the port of Ogdensburg, State of New York, by lake, having passed over St. Clair flats during the year ending December 31, 1855.

Tons of merchandise shipped from the port of Ogdensburg, New York, which went over St. Clair flats in the year 1855, and not included in any other statement herewith presented.

Quantity-----	5,381
Price of each-----	\$300
Value-----	1,614,300

There was no way of getting all the items in detail constituting this merchandise. I have, therefore, estimated it in gross at \$300 per ton, the same as for articles of like description shipped from Detroit, (see N. 43.) It is a low average, undoubtedly below the real value, as it includes costly articles, such as teas, sugar, coffee, and groceries of all kinds, woolen and cotton goods, clothing, liquors, &c.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c ,

Chicago, December 31, 1855.

N 53.

Statement of the number of vessels and their tonnage belonging to the several districts herein named, which were engaged in the trade over St. Clair flats; also the estimated value of the said vessels in the year 1855.

Collection districts.	Number of vessels belonging to each district trading over St. Clair flats.	Average tonnage of each vessel, including both steam and sail vessels.	Total tonnage of each district trading over St. Clair flats.	Average value per ton register of each vessel, including both steam and sail vessels.	Total valuation of vessels trading over St. Clair flats.
Chicago, Illinois.....	70	300	21,000	\$40 00	\$840,000 00
Milwaukie, Wisconsin.....	50	300	15,000	40 00	600,000 00
Detroit, Michigan.....	57	375	21,375	50 00	1,068,750 00
Cleveland, Ohio.....	150	450	67,500	45 00	3,037,500 00
Buffalo, New York.....	120	450	54,000	45 00	2,430,000 00
Oswego, New York.....	50	275	13,750	35 00	481,250 00
Ogdensburg, New York.....	10	275	2,750	35 00	96,250 00
Total.....	507	-----	195,375	-----	8,553,750 00

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 54.

I.—*Statement of the amount of freight accruing on the tonnage belonging to the districts herein named, which passed over St. Clair flats in American vessels in the year 1855.*

Collection districts.	Amount of freight in registered tonnage belonging to each district which passed over St. Clair flats in American vessels.	Cost of freight per registered ton.	Cost of freight for each district on tonnage which passed over St. Clair flats in American vessels in 1855.	Total value of freights accruing on shipments over St. Clair flats in American vessels in each district for the year 1855.
Chicago, Illinois—				
Shipments to. (See N 55)---	488,913	\$6 00	\$2,933,478 00 }	\$5,770,056 00
Shipments from. (See N 56)---	472,763	6 00	2,836,578 00 }	
Milwaukie, Wisconsin—				
Shipments to. (See N 57)---	206,421	6 00	1,238,526 00 }	2,485,062 00
Shipments from. (See N 58)---	207,756	6 00	1,246,536 00 }	
Detroit, Michigan—				
Shipments to. (See N 59)---	279,330	6 00	1,675,980 00 }	3,405,348 00
Shipments from. (See N 60)---	288,228	6 00	1,729,368 00 }	
Cleveland, Ohio—				
Shipments to. (See N 61 and N 63) -----	107,059	6 00	642,354 00 }	1,393,548 00
Shipments from. (See N 62 and N 64)-----	125,199	6 00	751,194 00 }	
Buffalo, New York—				
Shipments to. (See N 65)---	55,388	6 00	332,328 00 }	682,416 00
Shipments from. (See N 66)---	58,348	6 00	350,088 00 }	
Oswego, New York—				
Shipments to. (See N 67)---	1,324	6 00	7,944 00 }	15,888 00
Shipments from. (See N 68)---	1,324	6 00	7,944 00 }	
Ogdensburg, New York—				
Shipments to. (See N 69)---	450	6 00	2,700 00 }	9,522 00
Shipments from. (See N 70)---	1,137	6 00	6,822 00 }	
Total-----	*2,293,640	-----	-----	†13,761,840 00

* Total amount of freight in registered tonnage which passed St. Clair flats in American vessels in the year 1855.

† Total amount in money which accrued on freights over St. Clair flats in American vessels in the year 1855.

N 54—Continued.

II.—Statement of the amount of freight accruing on the tonnage which passed over St. Clair flats, in foreign vessels, to and from American ports, in the year 1855.

Names of American ports to and from which cargoes were shipped over St. Clair flats, in foreign vessels.	Amount of freight, computed in American registered tonnage, which passed over St. Clair flats, in foreign vessels, in the year 1855.	Estimated cost of freight per registered ton.	Estimated cost of freight on tonnage which passed over St. Clair flats, in foreign vessels, in the year 1855.	Total estimated value of freight accruing on shipments over St. Clair flats, in foreign vessels, in the year 1855.
Chicago, Illinois. (See N 55 and N 56)-----	87,846	\$6 00	\$527,076 00	\$551,256 00
Cleveland, Ohio. (See N 61 and N 62)-----	4,030	6 00	24,180 00	
Total-----	91,876	-----	-----	551,256 00

J. D. GRAHAM,

Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

N 55.

Statement of the number and tonnage of American and foreign vessels that arrived at the port of Chicago, Illinois, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Chicago, Illinois, that came over St. Clair flats in 1855.

National character of vessels.	Number of the crossings of American vessels that have come over St. Clair flats.	Number of the crossings of foreign vessels that have come over St. Clair flats.	Tonnage that has come over St. Clair flats in American vessels.	Tonnage that has come over St. Clair flats in foreign vessels.	Total tonnage, both American and foreign, that came over St. Clair flats to port of Chicago in 1855.
American -----	1,432	-----	488,913	-----	488,913
Foreign -----	-----	117	-----	35,386	35,386
Total-----	-----	-----	-----	-----	524,299

J. D. GRAHAM,

Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

N 56.

Statement of the number and tonnage of American and foreign vessels that went from the port of Chicago, Illinois, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Chicago, Illinois, that went over St. Clair flats in 1855.

National character of vessels.	Number of the crossings of American vessels that have gone over St. Clair flats.	Number of the crossings of foreign vessels that have gone over St. Clair flats.	Tonnage that has crossed St. Clair flats in American vessels.	Tonnage that has crossed St. Clair flats in foreign vessels.	Total tonnage, both American and foreign, that went from the port of Chicago and passed over St. Clair flats in the year 1855.
American-----	1,437	-----	472,763	-----	472,763
Foreign-----	-----	123	-----	34,891	34,891
Total-----	-----	-----	-----	-----	507,654

J. D. GRAHAM,

Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago December 31, 1855.

N 57.

Statement of the number and tonnage of American and foreign vessels that arrived at the port of Milwaukee, Wisconsin, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Milwaukee, Wisconsin, that came over St. Clair flats in 1855.

Number of the crossings of American vessels that have come over St. Clair flats.	450
Tonnage that has come over St. Clair flats in American vessels-----	206,421
Total American tonnage that arrived at the port of Milwaukee and came over St. Clair flats in the year 1855-----	206,421

J. D. GRAHAM,

Major Top. Eng., Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago December 31, 1855.

N 58.

Statement of the number and tonnage of American vessels that went from the port of Milwaukie, Wisconsin, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Milwaukie, Wisconsin, that went over St. Clair flats in 1855.

Number of the crossings of American vessels that have gone over St. Clair flats.	439
Tonnage that has crossed St. Clair flats in American vessels-----	207,756
Total American tonnage that went from the port of Milwaukie and crossed St. Clair flats in the year 1855-----	207,756

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 59.

Statement of the number and tonnage of American vessels that arrived at the port of Detroit, Michigan, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Detroit, Michigan, that came over St. Clair flats in 1855.

Number of the crossings of American vessels that have come over St. Clair flats -----	428
Tonnage that has come over St. Clair flats in American vessels-----	279,330
Total American tonnage that arrived at the port of Detroit and came over St. Clair flats in the year 1855-----	279,330

This statement does not include the vessels that arrived from the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 60.

Statement of the number and tonnage of American vessels that went from the port of Detroit, Michigan, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Detroit, Michigan, that went over St. Clair flats in 1855.

Number of the crossings of American vessels that have gone over St. Clair flats.	496
Tonnage that has crossed St. Clair flats in American vessels-----	288,228
Total American tonnage that went from the port of Detroit and crossed over St. Clair flats in the year 1855-----	288,228

This statement does not include the vessels that cleared from this port for the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 61.

Statement of the number and tonnage of American and foreign vessels that arrived at the port of Cleveland, Ohio, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Cleveland, Ohio, that came over St. Clair flats in 1855.

National character of vessels.	Number of the crossings of American vessels that have gone over St. Clair flats.	Number of the crossings of foreign vessels that have come over St. Clair flats.	Tonnage that has come over St. Clair flats in American vessels.	Tonnage that has come over St. Clair flats in foreign vessels.	Total American and foreign tonnage that arrived at the port of Cleveland and came over St. Clair flats in the year 1855.
American -----	172	-----	96, 474	-----	96, 474
Foreign -----	-----	14	-----	1, 036	1, 036
Total -----	-----	-----	-----	-----	97, 510

This statement does not include the vessels that arrived at this port from the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 62.

Statement of the number and tonnage of American and foreign vessels that went from the port of Cleveland, Ohio, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Cleveland, Ohio, that went over St. Clair flats in 1855.

National character of vessels.	Number of the crossings of American vessels that have gone over St. Clair flats.	Number of the crossings of foreign vessels that have gone over St. Clair flats.	Tonnage that has crossed St. Clair flats in American vessels.	Tonnage that has crossed St. Clair flats in foreign vessels.	Total American and foreign tonnage that went from the port of Cleveland and crossed St. Clair flats in the year 1855.
American -----	198	-----	115, 128	-----	115, 128
Foreign -----	-----	18	-----	2, 188	2, 188
Total -----	-----	-----	-----	-----	117, 316

This statement does not include the vessels that cleared for the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &C., Chicago, December 31, 1855.

N 63.

Statement of the number and tonnage of American vessels that arrived at the port of Toledo, Ohio, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Toledo, State of Ohio, that came over St. Clair flats in 1855.

Number of the crossings of American vessels that have come over St. Clair flats.	73
Tonnage that has come over St. Clair flats in American vessels.....	10,585
Total American tonnage that arrived at the port of Toledo and came over St. Clair flats in the year 1855.....	10,585

This statement does not include the vessels that arrived at this port from the ports of Chicago and Milwaukie.

J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE OF GENERAL SUPERINTENDENCE, &c., Chicago, Dec. 31, 1855.

N 64.

Statement of the number and tonnage of American vessels that went from the port of Toledo, Ohio, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Toledo, State of Ohio, that went over St. Clair flats in 1855.

Number of the crossings of American vessels that have gone over St. Clair flats..	69
Tonnage that has crossed St. Clair flats in American vessels.....	10,071
Total American tonnage that went from the port of Toledo and crossed St. Clair flats in the year 1855.....	10,071

This statement does not include the vessels that cleared from this port for the ports of Chicago and Milwaukie.

J. D. GRAHAM,
Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, Dec. 31, 1855.

N 65.

Statement of the number and tonnage of American vessels that arrived at the port of Buffalo, New York, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Buffalo, New York, that came over St. Clair flats in 1855.

Number of the crossings of American vessels that have come over St. Clair flats.	184
Tonnage that has come over St. Clair flats in American vessels.....	55,388
Total American tonnage that arrived at the port of Buffalo and came over St. Clair flats in the year 1855.....	55,388

This statement does not include the vessels that arrived from the ports of Chicago and Milwaukie.

J. D. GRAHAM,
Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, Dec 31, 1855.

N 66.

Statement of the number and tonnage of American vessels that went from the port of Buffalo, New York, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Buffalo, New York, that went over St. Clair flats in 1855.

Number of the crossings of American vessels that have gone over St. Clair flats..	210
Tonnage that has crossed St. Clair flats in American vessels.....	58,348
Total American tonnage that went from the port of Buffalo and crossed St. Clair flats in the year 1855.....	58,348

This statement does not include the vessels that cleared from this port for the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, Dec. 31, 1855.

N 67.

Statement of the number and tonnage of American vessels that arrived at the port of Oswego, New York, and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Oswego, New York, that came over St. Clair flats in 1855.

Number of the crossings of American vessels that have come over St. Clair flats	8
Tonnage that has come over St. Clair flats in American vessels.....	1,324
Total American tonnage that arrived at the port of Oswego and came over St. Clair flats in the year 1855.....	1,324

This statement does not include the vessels that arrived at this port from the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, Dec. 31, 1855.

N 68.

Statement of the number and tonnage of American vessels that went from the port of Oswego, New York, and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Oswego, New York, that went over St. Clair flats in 1855.

Number of the crossings of American vessels that have gone over St. Clair flats..	8
Tonnage that has crossed St. Clair flats in American vessels.....	1,324
Total American tonnage that went from the port of Oswego and crossed St. Clair flats in the year 1855.....	1,324

This statement does not include the vessels that cleared from this port for the ports of Chicago and Milwaukie.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, Dec. 31, 1855.

N 69.

Statement of the number and tonnage of American vessels that arrived at the port of Ogdensburg and came over St. Clair flats during the year ending December 31, 1855.

Arrivals at Ogdensburg, New York, that came over St. Clair flats in 1855.

Number of the crossings of American vessels that have come over St. Clair flats.	3
Tonnage that has come over St. Clair flats in American vessels	450
Total American tonnage that arrived at the port of Ogdensburg and came over St Clair flats in the year 1855	450

This statement does not include the arrivals at this port from the ports of Chicago and Milwaukie.

J. D. GRAHAM,
Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.
OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

N 70.

Statement of the number and tonnage of American vessels that went from the port of Ogdensburg and crossed St. Clair flats during the year ending December 31, 1855.

Departures from Ogdensburg, New York, that went over St. Clair flats in 1855.

Number of the crossings of American vessels that have gone over St. Clair flats	7
Tonnage that has crossed St. Clair flats in American vessels	1, 137
Total American tonnage that went from the port of Ogdensburg and crossed St. Clair flats in the year 1855	1, 137

This statement does not include the vessels that cleared from this port for the ports of Chicago and Milwaukie.

J. D. GRAHAM,
Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.
OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, December 31, 1855.

N 71.

Statement of the quantity and value of articles of merchandise shipped from the port of Cleveland, Ohio, in foreign vessels, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Coal ----- tons	2,768	\$5 00	\$13,840 00
Pork ----- barrels	196	15 00	2,940 00
Total value of merchandise shipped from the port of Cleveland, Ohio, in foreign vessels, which passed over St. Clair flats in the year 1855 -----			16,780 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 72.

Statement of the quantity and value of articles of the growth, produce, and manufacture of the United States, shipped from the port of Chicago to foreign countries, in American vessels, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Brick, lime and cement -----			\$100 00
Brown sugar ----- pounds	542	\$0 06 $\frac{1}{2}$	35 00
Butter ----- do	13,197	16 $\frac{7}{8}$	2,227 00
Corn ----- bushels	63,605	73 $\frac{1}{3}$	46,627 00
Corn meal ----- barrels	131	2 50	318 00
Candles ----- pounds	516	15 $\frac{1}{2}$	80 00
Flannel and other manufactured articles -----			81 00
Flour ----- barrels	3,791	9 15	34,716 00
Hams and bacon ----- pounds	161,734	7 $\frac{1}{2}$	12,804 00
Hemp ----- cwt	1,448	2 08 $\frac{1}{3}$	3,016 00
Horses ----- number	1	120 00	120 00
Lard ----- pounds	165,766	7 $\frac{84}{100}$	12,996 00
Lard oil ----- gallons	415	72 $\frac{1}{2}$	301 00
Manufactures from wood -----			805 00
Pork ----- barrels	2,445	15 16 $\frac{3}{4}$	37,086 00
Rye, oats, and other grain -----			1,396 00
Spirits from grain ----- gallons	206	36 $\frac{3}{4}$	75 00

N 72—Continued.

Articles.	Quantity.	Price of each.	Value.
Tallow.....pounds..	334,711	\$0 11 $\frac{1}{8}$	\$37,376 00
Tobacco.....hhds..	13	119 00	1,547 00
Wheat.....bushels..	57,908	1 47 $\frac{5}{6}$	85,607 00
Whiskey.....gallons..	448	40 $\frac{1}{2}$	181 00
Total value of merchandise, the growth, produce, and manufacture of United States, shipped from the port of Chicago to foreign countries, in foreign vessels, which passed over St. Clair flats in the year 1855			277,494 00

J. D. GRAHAM,

Major Top. Engrs., Brevet Lieutenant Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 73.

Statement of the quantity and value of articles of the growth, produce, and manufacture of the United States, shipped from the port of Chicago to foreign countries, in foreign vessels, having passed over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beef.....barrels..	1,467	\$13 00	\$19,071 00
Corn.....bushels..	119,225	76 $\frac{1}{4}$	90,909 00
Flour.....barrels..	2,692	7 15 $\frac{5}{7}$	19,268 00
Hams and bacon.....pounds..	45,537	7 $\frac{7}{9}$	3,542 00
Hemp.....cwt.....	121	8 10 $\frac{9}{10}$	981 00
Lard.....pounds..	31,460	9	2,831 00
Pork.....barrels..	4,760	16 25	77,353 00
Rye, oats, and other small grain.....			332 00
Wheat.....bushels..	274,090 $\frac{1}{2}$	1 48 $\frac{1}{2}$	407,024 00
Tallow.....pounds..	91,972	8	7,357 76
Total value of merchandise, the growth, produce, and manufacture of the United States, shipped from the port of Chicago to foreign countries, in foreign vessels, which passed over St. Clair flats in the year 1855.....			628,668 76

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

N 74.

Statement of the quantity and value of articles of foreign merchandise received at the port of Chicago from foreign countries, in American vessels, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Beer.....gallons.....	1,600	\$0 80	\$1,280 00
Pig iron.....cwt.....	1,960	1 00	1,960 00
Salt.....bushels.....	5,295	1 00	5,295 00
Wine.....dozen.....	23	7 33	168 59
Articles not enumerated, consisting of wearing apparel, woolen and cotton goods, and manufactures of wood.....			46,689 23
Total value of foreign merchandise received at the port of Chicago from foreign countries, in American vessels, which came over St. Clair flats in 1855.....			55,392 82

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c., Chicago, December 31, 1855.

N 75.

Statement of the quantity and value of articles of foreign merchandise received at the port of Chicago from foreign countries, in foreign vessels, having come over St. Clair flats during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Bar iron.....cwt.....	2,773	\$13 00	\$36,049 00
Pig iron.....do.....	9,777	1 00	9,777 00
All other articles, manufactures of wood, wearing apparel, woolen and a small portion of cotton goods.....			180,000 00
Total value of foreign merchandise received at the port of Chicago from foreign countries, in foreign vessels, which came over St. Clair flats in 1855.....			225,826 00

J. D. GRAHAM,

Major Top. Engineers, Bvt. Lieut. Colonel, Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, December 31, 1855.

II.—MOUTH OF CLINTON RIVER, MICHIGAN.

The appropriation for this improvement having been almost exhausted in the work which was done last year, we had not the means of continuing the work the past season.

For a full understanding of what has been done towards this improvement and of my views in relation to its further prosecution, I beg leave to refer to my report for 1855, hereto attached, as affording full estimates, in detail, of the cost of completing the work, and the statistics, for the year 1855, of the commerce of Mount Clemens, which is the nearest commercial town to the entrance of this river. It is as follows:

2.—MOUTH OF CLINTON RIVER, IN LAKE ST. CLAIR, MICHIGAN.

The plan for the improvement at the entrance of this river was originally presented by the late Captain Augustus Canfield, of the corps of topographical military engineers, in his report to the Topographical Bureau of September, 1853.*

It was illustrated on a map derived from accurate surveys made by himself and Captain J. N. Macomb, corps of topographical military engineers, during that month. We avail ourself of that map, hereto attached, (marked G No. 36 of our series of references,) in order to show, projected upon it, the progress actually made in the work under our direction during the working season of 1855.

It will be seen on reference to this map that the plan of the improvement is to mark the limits of the channel by two parallel rows of close piling, 150 feet apart, to extend from the depth of 9 (nine) feet in Lake St. Clair to the same depth in Clinton river. The length of each row of piles, to accomplish this, must be 2,400 feet, or 4,800 feet will be the length of piling required for both rows. It is proposed to dredge out a channel 100 (one hundred) feet wide, to a depth of nine feet, midway between the marginal piling. This will allow of an ample slope in the sides of the cut under water, when first made, and of the widening of the dredged channel to 130 feet hereafter, if required.

My report, No. 55, of November 25, 1854, (hereto attached, marked O 1,) will show the preliminary preparations made for carrying on this work soon after the subject was committed to my attention.

Owing to the great severity of the weather of 1854-'55, and the unusually long continuance of the ice on Clinton river in the spring of 1855, it was impracticable for the contractor to deliver the piles which had been engaged for this work until summer had commenced.

The early part of the season was, however, so boisterous that we could not have worked a floating horse-power pile-driver to advantage earlier, at this exposed locality, than the time of actual commencement of the work, which was the middle of July.—(See documents O 2 and O 3, hereto attached.)

* See page 150 of part 3d of the President's Message and the Accompanying Documents, sent to the 33d Congress, 1st session, and printed as Senate Doc. No. 1 (Executive) of that session.

The amount of funds remaining, originally entirely too small for this work, namely, five thousand dollars, (\$5,000,) compelled a curtailment of the plan, until further appropriations should be made, as shown in document O 1, hereto attached.

It also admonished us to work only during that portion of the season which promised the smoothest weather for our floating machinery, because we could not afford to be at expenses when no progress was being made in the work.

To manage the pile-driver and to direct the working party, I obtained the services of a skillful mechanic, Mr. William Gooding, of Detroit. Under his immediate supervision the work was pushed forward with industry whenever the weather and the smoothness of the sea would permit.

The work was well laid out by Mr. Gooding with a surveyor's compass, in accordance with the instructions to him from this office, hereto attached, marked O 3, and as illustrated on the accompanying map G No. 36. It was confined to the north side of the proposed channel, beginning near the light-house.

We succeeded, notwithstanding an unusually rough season, in driving 800 feet of close piling in two sections, viz:

Section 1st, from seven feet depth of water in the lake, and extending thence upwards of the current of the river. The length driven (see map) was.....	265 feet
Section 2d, from the light-house downward (see map).....	535 feet
Total length of close piling driven.....	800 feet

The open space left between these two sections is 550 feet, which is yet to be filled, and for which purpose we have piles enough delivered, and paid for, and also the pile-driver and horse to work it.

The reason for driving the piles in two sections instead of confining them all to the lower section was, that often when the sea was too rough to work the pile-driver at the lower or lakeward section it could be very well managed at the upper section, and the relative lengths of these two sections is a fair index of the relative duration of moderate and rough weather, or weather that would cause an inconvenient movement in the floating pile-driver during the summer of the year 1855.*

Such is the extent of close piling now done towards improving this channel at the entrance of Clinton river.

No dredging has yet been commenced, for the reason that the steam dredging machine for this lake was employed in deepening the channel over the St. Clair flats.

The limited extent of piling which has been accomplished is already a benefit to navigators in marking the best entrance to the river.

It is very important to the agricultural and lumbering interests of

* These piles were always driven until the resistance began to indicate a rupture of the head of the pile. They were driven into the soil at bottom 7 to 10½ feet, according to its compactness. The piles required from 15 to 45 blows of the pile-hammer, each, to drive them to that depth. Very few received less than 25 blows to settle them firmly down. J. D. G.

the people of those counties in Michigan watered by Clinton river that the improvement at its mouth should be perfected, in accordance with the original plan of Captain Canfield, which plan received the approval of the Board of Engineers. To do this will require another appropriation, for which I submit an estimate as follows, viz:

Estimate of the cost of completing the improvement at the entrance of Clinton river, Michigan, in accordance with the plan of the late Captain Canfield, Topographical Engineers, which has been duly approved:

1. Expenses of driving 550 piles to fill the space now existing between the two sections of the north side of the channel, (see map,) including dressing and handling of the piles, expenses of working the piles, driver, &c., at \$2 each.....	\$1,100 00
2. For 4,000 oak piles each 1 foot square and 25 feet long, = 100,000 feet lineal of oak timber 1 foot square, hewn and pointed, at 18 cents per foot.....	18,000 00
3. For driving 4,000 oak piles as above described, at \$2..	8,000 00
4. For dredging 22,000 cubic yards, at 15 cents per cubic yard.....	3,300 00
Sum.....	30,400 00
Add for contingencies 5 per cent	1,520 00
Amount of estimate.....	31,920 00
Deduct balance available of the last appropriation.....	585 08½
Amount of new appropriation required for Clinton river..	31,334 91½

I would recommend that the above sum be granted in two equal annual appropriations of \$15,667 46.

This will ensure the timely and economical delivery, by contract, of the requisite timber, and due progress of the dredging.

There is a light-house at the entrance of Clinton river. Its position is shown on the accompanying map, marked G No. 36.

The nearest commercial port to the mouth of this river is "Mount Clemens," five miles distant. The river is navigable to that place for vessels drawing full nine feet. Mount Clemens has a population of 2,500 souls. Its trade is shown for the year 1855 by the accompanying statements, marked O 5 and O 6, to have been as follows, viz:

1. Value of receipts in 1855, as per the accompanying statement, marked O 5.....	\$1,054,494 40
2. Value of exports by lake vessels in 1855, as per accompanying statement, marked O 6.....	554,434 87
Total value of the trade of Mount Clemens, Michigan, in the year 1855.....	1,608,929 27

That is to say one million six hundred and eight thousand nine hundred and twenty-nine dollars and twenty-seven cents.

Should the improvement proposed to be made at the mouth of Clinton river be soon completed, the amount of the commerce of Mount Clemens and the villages on the river would very soon reach five millions of dollars in value per annum.

GENERAL REMARKS.

List of maps and drawings which accompanied the foregoing reports.

This concludes our reports on the harbor improvements on Lakes Michigan and St. Clair.

The statistics of the commerce of the several ports treated of have been obtained by great labor, and with every attention to their strict accuracy. They have required a close examination of full one hundred and eighty thousand pages of folio manuscript mercantile and warehouse books. To those gentlemen who were so courteous as to allow me access to those valuable and reliable sources of information, so necessary to a fair and correct exposition of the amount and value of the commerce of the ports of Lake Michigan, and of that which passed over St. Clair flats in the year 1855, I take this mode of returning my acknowledgments.

The information thus obtained furnishes, perhaps, the best index that could be presented of the agricultural and commercial resources of the States bordering on Lake Michigan, and of the rapid growth of her ports and cities. Great as they now seem to those who but yesterday, as it were, witnessed their commencement, they are not yet one-tenth part developed, and thrift is destined to follow the industry and enterprise of their inhabitants in as great a ratio for many years to come as during the past.

The following maps and illustrative drawings have been forwarded in duplicate to the Topographical Bureau with this report, marked letter G, with appropriate numbers added, viz:

Sheets G Nos. 5, 6, 7, 8, and 9, illustrating Lieutenant Colonel Graham's report on the Chicago light-house, dated July 30, 1854.

Map G No. 10.—Map of Kenosha harbor, Wisconsin, from surveys made in July, 1854.

Map G No. 11.—Map of Chicago bar in April, 1854.

Map G No. 12.—Map of Chicago harbor and bar, showing their condition after the dredging in 1854.

Map G No. 15.—Map of Racine harbor, Wisconsin, from surveys made in 1854.

Map G No. 16.—Map of Milwaukee harbor, Wisconsin, from surveys made in 1854.

Map G No. 17.—Map showing the limit of the excavation of the Fort Dearborn military reservation for the improvement of the navigation of the Chicago river, granted by the act of Congress of July 21, 1852, and showing also the lots in the said reservation granted to Jean Baptiste Beaubien, by the act of Congress of August 1, 1854.

Sheet G No. 18.—A perspective drawing, showing the old method of constructing cribs for harbor piers.

Sheets G Nos. 19, 20, and 21.—Sheets of drawings, showing Lieu-

tenant Colonel Graham's methods of constructing cribs for said purposes, under various cases therein described

Map G No. 22.—Map of Chicago harbor and bar in May and June, 1855, from survey.

Map G No. 23.—Map of same in August and September, 1855, from survey.

Sheet G No. 24.—Drawings illustrating the proposed manner of rebuilding the Chicago harbor piers above water in solid stone masonry.

Map G No. 25.—Map containing an erroneous exhibition of the line of Fort Dearborn excavation, under the act of July 21, 1852, which accompanied Mr. C. M. Conrad's War Department deed to the Illinois Central Railroad Company of October 14, 1852, and which caused embarrassment in fixing that line.

Map G No. 26.—Map which accompanied the memorial of the mayor and common council of the city of Chicago to the United States Senate, of January, 1852, in regard to the proposed limit of excavation by said corporation of a portion of the Fort Dearborn military reservation for improving the navigation of Chicago river at the city of Chicago, which also caused embarrassment in fixing that line.

Map G No. 27.—A portion of Birchard's map of the city of Chicago, illustrating Lieutenant Colonel J. D. Graham's report of February 16, 1855, to the Hon. Jefferson Davis, Secretary of War, in regard to a demarkation of the lots granted to J. B. Beaubien, by the act of Congress of August 1, 1854.

Map G No. 28.—A map of a portion of the city of Chicago, from careful survey under the direction of Lieutenant Colonel Graham, accompanying the same report, on the same subject.

Map G No. 29.—Map of Waukegan harbor, Illinois, from survey in 1855, showing the proposed breakwater.

Map G No. 30.—Map of Kenosha harbor, Wisconsin, from survey in 1855.

Sheet G No. 31.—Drawings in isometrical prospective of a chevaux-de-frise barrier, to protect Kenosha and Racine harbors from sand drifts.

Map G No. 32.—Map of Racine harbor, Wisconsin, from surveys in 1855.

Maps G Nos 33, 34 and 35.—Illustrating Lieutenant Colonel J. D. Graham's report of December 31, 1855, on the improvement of the navigation over the St. Clair flats, in the State of Michigan.

Map G No. 36.—Map illustrating his report on the improvement of the navigation at the mouth of Clinton river, State of Michigan, of December 31, 1855.

Sheet G No. 37, in 3 sections or parts.—Graphic profile, showing the daily fluctuation in the elevation of the surface of Lake Michigan at the extremity of the north pier of Chicago harbor, from September 1, 1854, to December 31, 1855, also showing the hour of observation, the direction and force of the winds, the nature of the weather, and the elevation of the lake surface.

All of which is respectfully submitted.

J. D. GRAHAM,
*Major Top. Eng'rs, Bvt. Lieut. Col., Sup. Eng'r
 of Lake Michigan and Lake St. Clair harbor works.*

All the above mentioned maps and drawings are also referred to in illustration of this my annual report for 1856, together with the following, which are in progress of completion, and will be forwarded in duplicates as soon as possible, and at least by the time the engraver can be ready to take them in hand, viz:

Map G No. 38.—Map of Chicago harbor and bar, from surveys made between the 29th of March and 9th April, 1856.

Map G No 42.*—Map of Kenosha harbor, Wisconsin, from survey in June, 1856.

Map G No. 43.—Chicago harbor and the remnant of the bar, showing the effect of the dredging done between the 22d of April and the 15th of September, 1856.

Map G No. 44.—Chicago harbor and bar, from survey made between the 11th and 14th of November, 1856, showing the effect of the violent gales of wind from the NW. and NNW. on the 12th, 13th, 14th and 23d of October, 1856, in diminishing the depth of water over the bar by the north channel.

Map G No. 45.—Sheboygan harbor, Wisconsin, from survey made in April 1856.

Map G No. 46.—Manitowoc harbor, Wisconsin, from survey made in August, 1856.

Map G No. 47.—St. Joseph harbor, Michigan, from survey in August, 1856.

Map G No. 48.—Black Lake harbor, Michigan, from survey in September, 1856.

Map G No. 49.—Harbor of Grand Haven, at the mouth of Grand river, Michigan, from survey in October, 1856.

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O 1.

Colonel Graham to Colonel Abert.

OFFICE GENERAL SUPERINTENDENCE OF

LAKE ST. CLAIR HARBOR WORKS,

[No. 55.]

Detroit, November 25, 1854.

SIR: In regard to the improvement of the entrance of Clinton river on Lake St. Clair, I have the honor to report that I have made a careful examination of the locality, embracing the depth of water and the nature of the bottom, and find them to correspond at this time with the survey and map of the late Captain Canfield, corps of Topographical Engineers, made in September, 1853. The surface of the lake is about six inches lower now than it was then, which makes the channel shallower by that quantity.

The decision of the War Department in regard to this work, communicated by the bureau for my government, is that "so much of the

* Sheets marked G Nos. 39, 40 and 41, relate to the proposed new light-house for Chicago harbor, and accompanied my report on that subject of the 9th of August, 1856, to the Light-house Board.
J. D. G.

plan [of the Board of Engineers] is approved as can be executed with advantage with the appropriation, or other funds available for the work."

The only available funds consist of the remainder of the last appropriation made by Congress, now in the treasury, viz: \$4,700.

To accomplish an improvement of decided advantage in itself with this sum, keeping in view a concordance with the general plan of the Board, has required that the most rigid economy should enter into every item of the proceeding.

The plan of the Board contemplated the formation of a channel 9 feet deep and 100 feet wide, by dredging out the natural channel from the 9 feet curve in the river, near its mouth, to the same depth in the lake, and the protection of the channel by two parallel rows of close piling, 150 feet apart.

The length of each row of piles would, in this case, be 2,400 feet, and the amount of dredging required would be, as shown by the Board, 21,958 cubic yards. The estimated expense of accomplishing this work, including the employment of a local agent one year, is \$10,070 45, which is more than double the amount now available.

In order to accomplish all that is practicable with the means at hand, in such manner as to render the improvement, as far as it goes, decidedly advantageous in itself to commerce, and at the same time conformable to the principles embraced in the plan of the Board, I have entered into contracts for materials, and the necessary appliances for the formation of a channel 7 feet deep and 100 feet wide, to be protected by two parallel rows of close piling, 150 feet apart. This will produce a result decidedly beneficial to commerce, and will, indeed, accommodate most of the trade interested in the improvement. It reduces the length of each of the two rows of piles to 1,400 feet, as will appear by reference to Captain Canfield's map, of September, 1853. It also reduces the quantity of sand to be removed by dredging, &c., to about 7,500 cubic yards. It is estimated that when the two parallel rows of piling shall be finished, the force of the current will remove at least one-half that quantity, leaving only about 3,750 cubic yards to be removed by dredging.

I have concluded a contract with Mr. J. L. Wolverton, of this place, for raising the United States dredge-boat, which has been lying sunk here since March last, and for pumping her out, and caulking her where required, as this is indispensable to having her ready to do the dredging at Clinton river.

He is to do it for the sum of \$400.

I have also made a contract with Mr. Charles Kellog, of this place, for building a one horse pile-driver complete, with floating scow support, hammer, windlass, &c., for \$800.

An estimate is herewith presented, marked C, for funds to meet these two payments, which I request may be remitted to me at Chicago, on or before the 20th of next month, amounting to \$1,200.

I have also concluded a contract with Mr. David Shook, of Mount Clemens, Michigan, for 168,000 feet (board measure) of one inch oak piling that will be required for 2,800 lineal feet, each pile to be 15 feet long, at \$11 per M, which will amount to the sum of \$1,848.

It is to be delivered as fast as possible, and the whole finished by or before the 31st of March, 1855. Estimates for this will be hereafter forwarded to cover payments, as may be required. It was only by arranging to have the timber furnished during the winter that it could be got so cheap. The same timber would have cost \$15 per M in the season of open navigation, when the demand for Lake Michigan is difficult to be supplied fast enough.

The following is my estimate for the disposition of the funds for this work, viz:

1. For raising, pumping and caulking the United States dredge.....	\$400 00
2. For a one horse pile-driver, with scow, &c.....	800 00
3. For 168,000 feet of 4-inch oak piles, at \$11 per M...	1,848 00
4. For driving 2,800 piles, at 30 cents each.....	840 00
5. For dredging 3,750 cubic yards, at 12½ cents.....	468 75
6. Due P. Campan for wharfage and care of dredge from January 1 to December 31, 1854, at \$10 per month.....	120 00
7. Wharfage for ditto from January 1 to April 30, 1855, at \$5 per month.....	20 00
8. Transportation, stationery, office rent, and contingencies	203 25
Amount	<u>4,700 00</u>

It will be seen by the above that the funds appropriated, and now available, will not possibly admit of the employment of a local agent for this work.

The master mechanic or head workman of the party for driving the piles will have to be depended upon for a diligent supervision of the labor, as it goes on, and for keeping the time-roll; and I shall have to make the payments myself once a month, which I can arrange.

I, therefore, am bound to report that it would, in my opinion, be inexpedient to appoint an agent under present circumstances; and I herewith respectfully return the papers referred to me on that subject, by your letter of June 26th last.

I am, very respectfully, sir, your obedient servant,

J. D. GRAHAM,

Maj. Top. Eng., Bvt. Lieut. Col., Sup. Eng., &c.

Colonel J. J. ABERT,

Chief Topographical Engineers, Washington.

C, attached to Document O 1.

Estimate of funds required by the 20th of December, 1854, on account of the improvement of the entrance of Clinton river, Michigan.

1. For raising, pumping out, and caulking the United States dredge boat, necessary to be employed on said improvement.....	\$400 00
2. For payment, as per contract, for a one-horse pile-driver, resting on a floating scow, with hammer, &c..	800 00
Amount required.....	<u>1,200 00</u>

J. D. GRAHAM,
Bvt. Lieut. Colonel, Superintending Engineer.

DETROIT, November 25, 1854.

O 2.

Colonel Graham to Mr. Gooding.—Instructions to commence work at the mouth of Clinton river, Michigan.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Detroit, July 16, 1855.

SIR: Funds having been furnished to you, you will please purchase a horse and the necessary harness to work the pile-driver, and proceed with them to the mouth of Clinton river, and there commence, as soon as practicable, to drive the piles according to the plan which I will send to you from Chicago.

You will please send to me, at Chicago, a statement of the number of piles, and also the number of feet, board measure, (reckoning according to the contract,) which Mr. Shook has delivered, so that I may forward to him a check for the cost of the same.

So soon as you shall have done this, and have made all preparations to commence work, you will raise a working party and commence operations.

I am, very respectfully, &c.,

J. D. GRAHAM,
Lieut. Col. Superintending Engineer, &c., &c.

Mr. WILLIAM GOODING,
Foreman of party for Clinton River Improvement, Detroit.

O 3.

Colonel Graham's instructions to Mr Gooding for laying out the work at Clinton river, Michigan.

OFFICE GENERAL SUPERINTENDENCE, &c.,
Chicago, July 19, 1855.

SIR: I herewith enclose to you a drawing, (see the accompanying map, marked G No. 36,) which will be your guide in driving the

two parallel rows of plank piling to form a channel 150 feet wide between those parallel rows of piling.

The original intention was to form a channel 9 feet deep from A to B, as indicated by the curved lines in *blue* on the drawing. But the funds available for the object in view not being sufficient for forming a channel of that depth, the plan is so far modified, in the beginning of the work, as to form a channel of that width full 7 feet deep, between the blue lines, to extend from a point opposite to C to a point in the lake opposite to D; that is to say, the blue curved line C D is to be the north side, and E F the south side of the channel to be formed by the piling. This channel will extend from the depth of 7 feet in the river, opposite to the light-house, to the same depth in Lake St. Clair, and when the piling is finished it will be dredged out to that depth all the way.

You will lay out your line of piling on the north side by the lines and figures which are laid down in red, as follows, viz:

Place a surveyor's compass at C, on the southwest corner of the light-house pier, and on a course by compass of N. $77\frac{3}{4}^{\circ}$ E., drive twelve stakes 110 feet apart. Then drive a 13th stake 110 feet from the 12th, which will indicate the point marked D on the drawing. This point D should be in at least 7 feet of water; if you find it less, continue the line till you reach 7 feet.

Then perpendicular to this line, or on a course by compass in each instance of S. $12\frac{1}{4}^{\circ}$ E., lay off from your stakes the distance marked in red figures in the drawing; that is to say, from the corner C, of the light-house pier, lay off 35 feet, and drive a pile there; from your first stake lay off 65 feet and drive a pile; from your 2d stake lay off $92\frac{1}{2}$ feet and drive a pile; 3d stake, 115 feet; 4th stake, 135 feet; 5th stake, 145 feet; 6th stake, 150 feet; 7th stake, $147\frac{1}{2}$ feet; 8th stake, 140 feet; 9th stake, 125 feet; 10th stake, $107\frac{1}{2}$ feet; 11th stake 80 feet; 12th stake, 45 feet. You will now have the north line of the channel marked out. In each case drive a pile on the same course (S. $12\frac{1}{4}^{\circ}$ E.) 150 feet from each of the above named, and these will mark out the south margin of your channel. Then fill up the spaces with close piling, and your channel will be marked out ready for dredging.

In case you should find with your compass at C, (the SW. corner of the pier,) that the southeast corner is in the way of your view of the stake D, when looking N. $77\frac{3}{4}^{\circ}$ E., you must in that case put your compass on the southeast corner of the pier, and lay off your course of N. $77\frac{3}{4}^{\circ}$ E. from that corner. In this event your first stake must be driven on the line 45 feet from the said SE. corner of the pier. All the other stakes will be driven as before stated.

You will please report briefly by mail every Saturday evening the progress made.

I am, very respectfully, sir,

J. D. GRAHAM,
Lieut. Col., Superintending Engineer

WILLIAM GOODING,
Foreman Clinton River Improvement.

O 4.

Colonel Graham to Mr. Gooding, Foreman of Party.

OFFICE GENERAL SUPERINTENDENCE, &c.

Chicago, August 20, 1855.

SIR: I have received your report of the 18th instant. When it is too rough to drive the piles outside, perhaps you could be driving at other places, say opposite to and just below the light-house. If so, this would meet my approbation. If you settle once a month for the pay of the labor ersand for the oats, and other small matters, it will suit to have all in one voucher, which you get of the same person. When the weather is too windy to drive piles anywhere, you can employ your party in dressing and pointing them. Let me know as soon as Mr. Shook delivers another parcel.

Respectfully, your obedient servant,

J. D. GRAHAM.

Lieut. Col., Superintending Engineer, &c.

WILLIAM GOODING,

*Foreman, &c., stationed at mouth of**Clinton River, Michigan.*

O. 5.

Statement of the quantity and value of articles of merchandise received at the port of Mount Clemens, State of Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Buggies -----number ..	30	\$100 00	\$3,000 00
Grain drills -----do ..	24	50 00	1,200 00
Ground plaster -----tons ..	400	9 00	3,600 00
Leather -----pounds ..	60,426	20	12,085 20
Marble -----tons ..	50	12	600 00
Merchandise -----M pounds.	8,000	125 00	1,000,000 00
Ploughs -----number ..	300	8 00	2,400 00
Quick lime -----barrels ..	2,500	87½	2,188 00
Steam engines & steam boilers ..number..	4	3,250 00	13,000 00
Stone ware -----gallons ..	5,217	10	521 70
Stove castings -----tons ..	125	100 00	12,500 00
Wagons -----number ..	40	60 00	2,400 00
Water lime -----barrels ..	500	2 00	1,000 00
Total value of merchandise received at the port of Mount Clemens, Michigan, during the year ending Dec. 31, 1855 ..			1,054,494 90

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Col., Superintending Engineer.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

Chicago, December 31, 1855.

Resubmitted November 15, 1856.

J. D. GRAHAM,

Major Topographical Engineers, Brevet Lieut. Colonel, &c., &c.

O. 6.

Statement of the quantity and value of articles of merchandise shipped from the port of Mount Clemens, Michigan, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....barrels.....	700	\$2 00	\$1,400 00
Barley.....bushels.....	600	75	450 00
Beans.....barrels.....	659	1 00	659 00
Beef.....do.....	100	10 00	1,000 00
Beeswax.....pounds.....	570	25	142 50
Bran and shorts.....tons.....	150	12 00	1,800 00
Brick.....M.....	3,000	3 50	10,500 00
Butter.....pounds.....	98,500	20	19,700 00
Corn.....bushels.....	10,000	62	6,200 00
Corn meal.....barrels.....	2,680	4 00	10,720 00
Cranberries.....do.....	350	8 00	2,800 00
Flour.....do.....	49,770	7 50	373,275 00
Furniture.....pounds.....	110,000	1	1,100 00
Furs.....			675 00
Grass seed.....barrels.....	75	5 00	375 00
Hay.....tons.....	85	8 00	680 00
Hides.....pounds.....	2,700	5	135 00
Oats.....bushels.....	9,000	35	3,150 00
Pork.....barrels.....	140	16 00	2,240 00
Pot and pearl ashes.....tons.....	45	120 00	5,400 00
Potatoes.....bushels.....	3,527	62	2,186 74
Rags.....pounds.....	10,000	3	300 00
Rough staves.....M.....	1,500	25 00	37,500 00
Sawed lumber.....M feet.....	4,000	10 00	40,000 00
Square timber.....do.....	500	12 00	6,000 00
Wool.....pounds.....	72,111	33	23,796 63
Wood.....cords.....	1,500	1 50	2,250 00
Total value of merchandise shipped from the port of Mount Clemens, Michigan, during the year ending December 31, 1855.....			554,434 87

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Col., Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE OF LAKE MICHIGAN WORKS,

*Chicago, December 31, 1855.*OFFICE GENERAL SUPERINTENDENCE, &c., *Chicago, Nov. 15, 1856.*

Referred to and resubmitted in reference to my annual report, No. 161, for the year 1856.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Col., Superintending Eng., &c., &c.

RECAPITULATION OF ESTIMATES.

I now conclude this, my annual report for 1856, by the following recapitulation of the amounts estimated for the completion of each work, and also of the amount recommended to be appropriated the first year in each case, as follows, viz:

No.	Name of work.	Amount estimated to complete the work.	Amount asked for the first year.
1	Chicago harbor, Illinois.....	\$174,450 74	\$87,225 37
2	Waukegan breakwater, Illinois.....	137,966 10	60,000 00
3	Kenosha harbor, Wisconsin.....	58,047 24	58,047 24
4	Racine harbor, Wisconsin.....	43,992 45	43,992 45
5	Milwaukie harbor, Wisconsin.....	48,283 51	48,283 51
6	Sheboygan harbor, Wisconsin.....	37,175 25	37,175 25
7	Manitowoc harbor, Wisconsin.....	62,780 92	40,000 00
8	Michigan City breakwater, Indiana.....	384,376 50	100,000 00
9	New Buffalo harbor, Michigan.....	67,012 08	33,506 04
10	St. Joseph harbor, Michigan.....	109,542 71	50,000 00
11	Black Lake harbor, Michigan.....	105,225 78	52,612 89
12	Grand Haven harbor, at the mouth of Grand river, Michigan.....	162,126 00	54,042 00
13	Mouth of Clinton river, in Lake St. Clair, Michigan.....	31,334 92	15,667 46
	Total.....	1,422,314 20	680,552 21

All which is respectfully submitted.

J. D. GRAHAM,

Major Top. Engineers, Brevet Lieut. Colonel, Superintending Engineer, &c.

OFFICE GENERAL SUPERINTENDENCE, &c.,

Chicago, November 15, 1856.

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Senate documents

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